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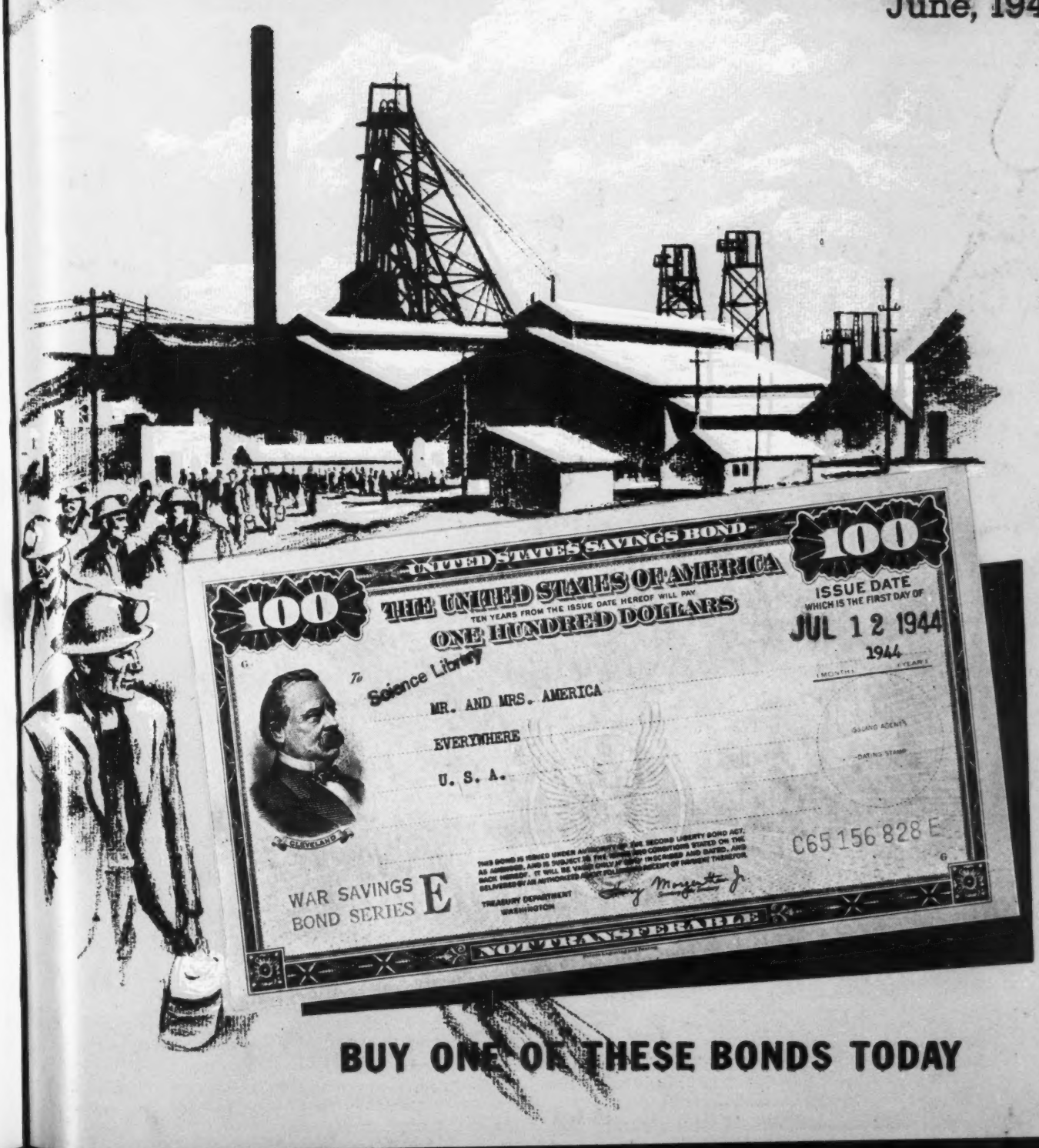

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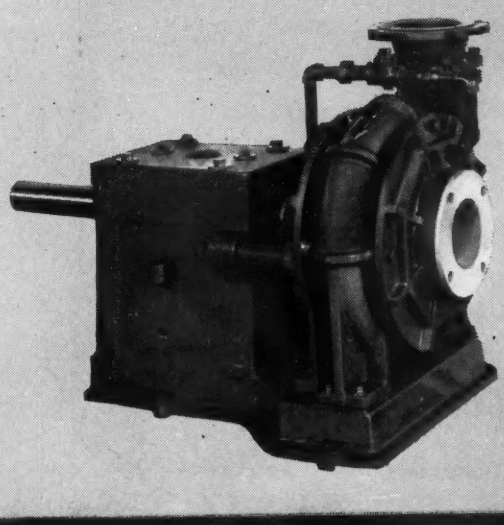

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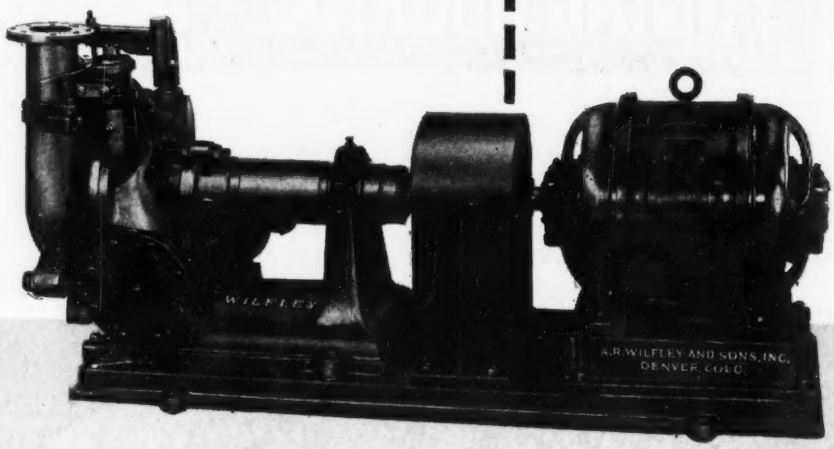

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ENGINEERING AND MINING JOURNAL

H. C. Parmelee, Editor

A Lesson From the Past in Exploration

RAYMOND BROOKS' account of the mineral exploration work in Northern Rhodesia in the early twenties, which is appearing currently in *E.&M.J.* in a series of three articles, is recommended to every reader. It is a fascinating story of bonanza finds, such as every mining man would like to be able to tell, as of his own experience. More important, though, is the description of the technique used in discovering the mineral showings that were subsequently trenched or opened by the Rhodesian-Congo Border Concession, of which Mr. Brooks was manager. The procedure followed was based on plain "horse sense" in finding out what the natives knew as to occurrences of such showings in an area the size of England, and in offering them generous prizes by way of an incentive to disclose their knowledge and to look for new occurrences. Services of the experienced practical prospector also were extensively employed. The marvelous success achieved with this procedure commands attention for it and for the article. To it the United Nations, and Britain in particular, are indebted for the availability today of the huge addition to copper reserves provided by the Rhodesian deposits.

Astonishing, however, is the charge of indifference to these new discoveries, until it was too late to "get in" on them to any material extent, which Mr. Brooks makes against the major American copper groups. Such indifference shows little of the spirit of enterprise and the ability to sniff a profit which have long been characteristics of American mining capital and have taken it into so many parts of the world. Even though American-controlled reserves were still of generous size, it is amazing that an excellent chance to add importantly to them should have gone so largely ignored.

Here was a good bet that had no takers, whatever be the explanation. Let us profit from the lesson. From the time the war emergency began, American funds have been spent freely and increasingly in foreign lands, and our engineers have been sent abroad in efforts to stimulate the supply of wanted minerals and other raw materials. The practical, sensible technique pursued by Mr. Brooks could well be followed where conditions warrant. Discoveries have been made and, as the veil of censorship is lifted, it may be seen that many of them are important. Whatever be the post-war scheme, if any, that may be developed for distributing metals and minerals, it will be unfortunate if these wartime efforts of this country do not redound materially to its future benefit.

Crucial Period for Gold and Silver

THE INTERNATIONAL CONFERENCE on monetary matters, to be held at Bretton Woods, N. H., beginning July 1 (p. 100), will be an important event to mining organizations which derive income from gold and silver. As indicated in our March issue (p. 64), the currencies of the world are in a chaotic state, and policies are bound to be formulated soon which are likely to give direction to monetary systems for a long time. Therefore, if the producers of gold and silver care to have any part in determining the positions of gold and silver in monetary systems, they should act now.

A notable step in the direction of public education on currency matters—which we believe to be the only sensible course in their own interest open to precious-metal producers—has been taken recently by F. H. Brownell, board chairman of American Smelting and Refining Co., in the publication of an interesting pamphlet entitled "Hard Money." In this analysis, Brownell presents a case for both hard money and international bimetallism, offering a basis for the latter that takes account of the lessons of experience.

Creating an exception to the puzzling apathy which seems to be overtaking mining men toward matters which vitally concern them, Brownell also appeared before a Congressional committee (p. 100) to explain his views on international bimetallism. As a sequel to this incident, the committee asked Herbert Bratter, a Washington economist, to prepare a report on Brownell's testimony. Bratter's report was principally an attack on silver producers and politicians, rather than on bimetallism *per se*.

If the arguments presented by Bratter are any clue to the position that will be taken by the antagonists of bimetallism, the logical course to be taken by silver's protagonists is apparent. They should avoid personalities and recriminations, and insist that bimetallism be considered on its own merits, not in the light of whatever past mistakes its advocates may have made.

Bratter vigorously attacks what he characterizes as unilateral action to establish "international" bimetal-

lism. We submit, as stated in our March issue, that it is a waste of time to propose the international reestablishment of silver as a monetary base if we are not prepared to agree to the determination of a silver price by genuine international study and agreement. The Oriental nations will stick to gold-exchange standards and confine silver to the status of subsidiary coinage rather than risk duplicating their experience of the thirties, when we offered prices for silver that induced them to deplete their monetary stocks.

A matter of great interest to gold producers is whether or not the proposed basis for international currency stabilization is really a boost for gold's status. The commonly held view, which we fear is superficial, is that it is. This idea is bolstered by Harry D. White, Treasury expert, who stated on Memorial Day that, "There can be little doubt that success (of the conference) will perpetuate the value of gold."

We would be more inclined to accept the White viewpoint if his fellow advocates of the stabilization plan in Great Britain were not representing it in a far different light. Currently, London financial circles and the Labor Party are extremely antagonistic toward the readoption of the gold standard in any form. The Labor Party refers to a gold standard as a "policy of collective suicide" and declares that it wants "no gold standard or any other system of automatic and rigid rates of foreign exchange which might force Britain to reduce its monetary expenditure and create unemployment because some other country may be suffering from depression." In a nutshell, the British want to keep their hands free to resort to currency juggling if that will improve their trade position or the stability of their domestic economy. They find it impossible to view any development as progress that might reduce the power or prestige of the mother country, even though their three most important colonies produce most of the world's gold and are heavily dependent on income from the sale of gold.

Replying to British fears over the gold standard, Sir John Anderson, Chancellor of the Exchequer, told the House of Commons, "I believe there is in fact no foundation for the view that this scheme in any way involves a return to the gold standard. Certainly the attitude of the present government would be one of the most vehement opposition." Lord Keynes, the leading British proponent of a stabilization plan, later supplemented this statement by saying that the present plan is if anything the exact opposite of the gold standard.

We incline to the view that adoption of the proposed plan would give gold a "face lifting" which it scarcely needs at the present time, while it is enjoying a widespread demand at premium prices. We fear that in the long run an international stabilization plan, if successful, would reduce the prestige of gold as a settler of international balances. Such a plan is bound to develop the substitution of credit devices for gold transfers, and gradually reduce the internationally held gold stock to the emasculated status which gold now occupies in our domestic currency system. Therefore, taking the long-range view, we believe that gold producers should oppose any international currency stabilization plan. Gold itself is a stabilization plan.

That Trojan Horse Again

On May 12 Senators Murray of Montana and Hayden of Arizona introduced S. 1912, a bill which provides for the compulsory preservation of records now in government hands concerning mineral deposits. In introducing the measure, the senators called attention to the extensive and costly information on mineral deposits which has been secured during the war and suggested that all this information should be deposited with the Bureau of Mines.

This enunciation of a perfectly sound objective seems rational enough, and probably nobody was more surprised than the two senators over the disturbance that ensued. The fly in the soup turned out to be the circumstance that many of these records were secured from private sources with the understanding that they were to be held confidential by the war agencies. Many of the companies which voluntarily handed such information over to war agencies, which they trust, would have cut out their tongues before divulging the same information to the Interior Department, which they suspect of harboring sinister designs on private enterprise in the basic industries.

Thus, in order to accomplish a worthy objective, if the government uses the method prescribed in the present bill, it will place itself in the position of wilfully violating solemn pledges and confidences.

The bill has the earmarks of having been prepared in the Interior Department and handed to the senators for introduction. We see no basis for assuming that these senators are privy to any "Trojan horse" scheme for undermining private enterprise, and wish that we could say the same for the Interior Department. However, by constantly devising legislative bills which have plausible justification but would in addition give the Interior Department new clubs which could be brandished over the heads of private enterprise, the department lays itself open to suspicion. Another such bill is that offered to Senator Murray's Military Affairs subcommittee, which would hand surplus war plants over to the Secretary of the Interior. The Trojan horse "joker" in this bill is that "if no (government) agency wants it, the Secretary may still retain the property in government ownership if he decides on the basis of certain factors that such retention is desirable."

We Are Not HAVE-NOT'S in Copper, Lead, and Zinc

EVAN JUST, *Associate Editor*

Data are presented to demonstrate that statements which characterize the United States as having reached a have-not status in minerals greatly underrate our true position in regard to copper, lead, and zinc. Charts showing the relationship between prices and production for the past fifteen years illustrate the profound effect of prices on production and give a rough idea of our future capacities at various prices

IT IS EVIDENT that the views expounded by Messrs. Batt and Rickenbacker—that this country is fast becoming a have-not nation in minerals, and should therefore sharply curtail domestic production and depend more heavily on mineral imports—are taking root in influential quarters to an extent that should be alarming to our domestic mining industries. Recently I have heard several men in high places lean toward this doctrine. This is not because they have malicious designs on the mineral industry. They are simply desirous of promoting foreign trade, and see here an answer to the puzzling question of what we are going to accept in return without the traditional fierce resistance from affected domestic producers. Naturally, they reason that if we are reaching a have-not status in minerals, there will be small grounds for resentment over drawing heavily on imports for our needs. Because Mr. Batt is a highly placed official with a non-political background, they assume that he knows what he is talking about when he says that our minerals are getting scarce.

Some general expressions of opinion on this subject were published in the April issue of *Engineering and Mining Journal* under the title, "National Policy on Mineral Imports," and will not be repeated here. However, if the mining industry wants to forestall the possibility that the Batt views may sway public and official opinion to an unwarranted extent, it should not content itself with generalities. This possibility is serious enough to justify an extraordinary effort by the industry to demonstrate its capacity to produce by detailed marshalling of facts. To do so is no mere library job; it calls for competent analysis of ore reserves, geological evidence, mining costs, and capacities of all the important mining districts of the country which are likely to be affected.

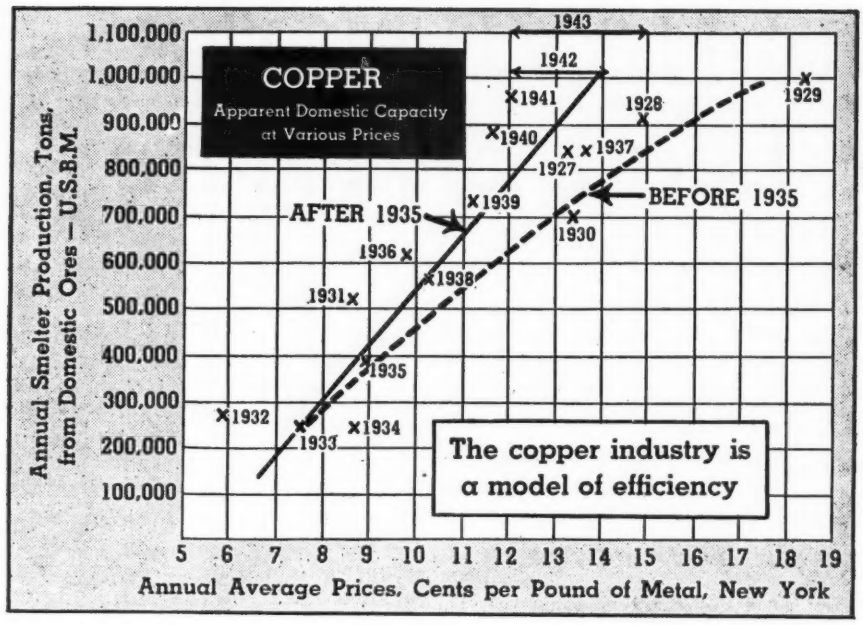
The experience of the zinc industry in its controversy with the government, just prior to the war, over the reduction of the import duties on zinc, should afford ample evidence that the government is capable of acting on false premises, and of being unwilling to admit mistakes when they are made. Only by the industries affected having overwhelming evidence to support their contentions while policy is in the formative stage can such painful blunders be avoided.

Zinc Data Show High Costs

Ever since the institution of the premium-quota plan for subsidizing some copper, lead, and zinc producers, these industries and the public have been in the dark as to actual average income received from sale of these metals. Therefore the figures cited by James Douglas, director of the Zinc Division of the War Production Board, at the recent annual meeting of the American Zinc Institute (*E&M.J.*, May, p. 94), published herewith, and followed on June 2 by release of similar information pertaining to lead, aroused great interest in industry circles. The policy pursued in releasing these figures is commendable, and could well be used as an example by other government agencies. Such facts are of no important use to the enemy, and are quite helpful to industry. The reluctance of some other government agencies to divulge harmless facts is difficult to understand.

The released figures not only illustrate the profound dependence of mineral production on prices, but are rather disturbing to those who are concerned with postwar costs. Producers who have had contact with the premium-quota procedure know that it is administered with a strong anti-profit slant; therefore costs cannot be very far below income received and may actually be greater. To observe that zinc income has risen to an average of 10.74 cents per pound, and that in the three important producing areas of the country the cost of zinc from the lowest-cost area is 8.87 cents and up to 13.08 cents in the highest, makes observers wonder what our competitive position will be after the war. Obviously, important segments of these high costs are due to manpower shortages; nevertheless, with labor organizations intimating that they will fight to retain the wage scales of wartime, it seems as though the combination of high wages and low ore grades may put the domestic industry in a difficult position. However, the difficulty may be ameliorated somewhat if the industry's competitors—competitive materials and foreign zinc producers—go through a similar experience.

These high domestic costs also point up the possibility that the field of mineral tariffs may become a battleground when and if subsidies are abandoned. Some operators now look on subsidies as a natural right in the



tween prices and production for these three metals over the past fifteen years.

It would be a mistake to place too great reliance on such charts, particularly in view of the uncertainty over labor costs and inflation. They should be regarded as a "spot check" on our situation rather than a reliable guide to the future. Nevertheless, they do bring out some interesting facts that may be helpful in analyzing our real capacity to produce.

The most obvious evidence brought out by the charts is the circumstance that mine production shrinks when prices go down and that it requires higher prices to stimulate increased production. The sharp difference between mining and manufacturing economy is illustrated, the same being due primarily to the fact that mines must turn to lower grade or less accessible ores when they want to increase production.

face of increased wages. This attitude springs out of the government policy of using subsidies as a means of settling wage disputes. Naturally, the employer who has been induced to raise wages on the premise that he will be bailed out with a subsidy increase will be aggrieved if he finds that the subsidies are pulled out from under him and there is resistance to commensurate adjustments of wages. In such a situation he is likely to see grounds for additional tariff protection, whereas all available evidence suggests that the government intends to pursue low-tariff policies.

Because government policy-making often leans heavily on the advice of economists who have little realization of the differences between mineral and manufacturing economy, there is some danger that false conclusions may be drawn from current statistics showing very high costs. Not realizing that expanding mineral production almost invariably requires price increases, whereas manufacturing costs are usually reduced by expanding capacity, some may conclude that domestic mining of copper, lead, and zinc is more or less "washed up" for good and all. Such a misconception could easily lead to policies that would cause hardship, embarrassment, and no end of wrangling between government and affected individuals.

Charts Show Broad Trends

Considerations of this kind led to an attempt to find other evidence bearing on our capacity to produce copper, lead, and zinc. As part of this effort, charts were made, reproduced herewith, which show the relationship be-

Average Price Paid per Pound of Zinc by Districts and by Mines in Each Quota Group, October-December 1943.

	Total Production of Recoverable Zinc, Tons [a]	Percent of Total Production [b]	Total Amount Paid, Dollars	Average Price Paid per Pound of Zinc, Cents
Eastern States				
A Quota Mines	53,100	94.6	9,063,835	08.53
B Quota Mines	1,110	2.0	294,250	13.25
C Quota Mines	1,902	3.4	596,750	15.69
Totals	56,112	100.0	9,954,835	08.87
Western States				
A Quota Mines	70,904	83.7	13,932,545	09.83
B Quota Mines	6,780	8.0	1,754,225	12.94
C Quota Mines	7,039	8.3	2,181,135	15.49
Totals	84,723	100.0	17,867,905	10.54
Tri-State				
A Quota Mines	16,596	31.8	3,381,730	10.19
B Quota Mines	16,745	32.1	4,356,440	13.00
C Quota Mines	18,828	36.1	5,905,680	15.68
Totals	52,169	100.0	13,643,850	13.08
Total U. S.				
A Quota Mines	140,600	63.7	26,378,110	09.38
B Quota Mines	24,635	15.4	6,404,915	13.00
C Quota Mines	27,769	20.9	8,683,565	15.64
Totals	193,004	100.0	41,466,590	10.74

[a] From data compiled by Ores and Concentrates Section, Zinc Division, WPB. Based upon monthly figures as reported by the Bureau of Mines for Eastern and Western States and by McColgin, of the Metals Reserve Co., for the Tri-State District. These figures differ slightly from the data as reported in the U. S. Bureau of Mines annual survey of mine production.

[b] Estimated on the basis of assigned quotas and over-quota production.

crease production. To mining men this may seem completely obvious. However, it is not thoroughly understood in government circles, to the disadvantage of the mining industry.

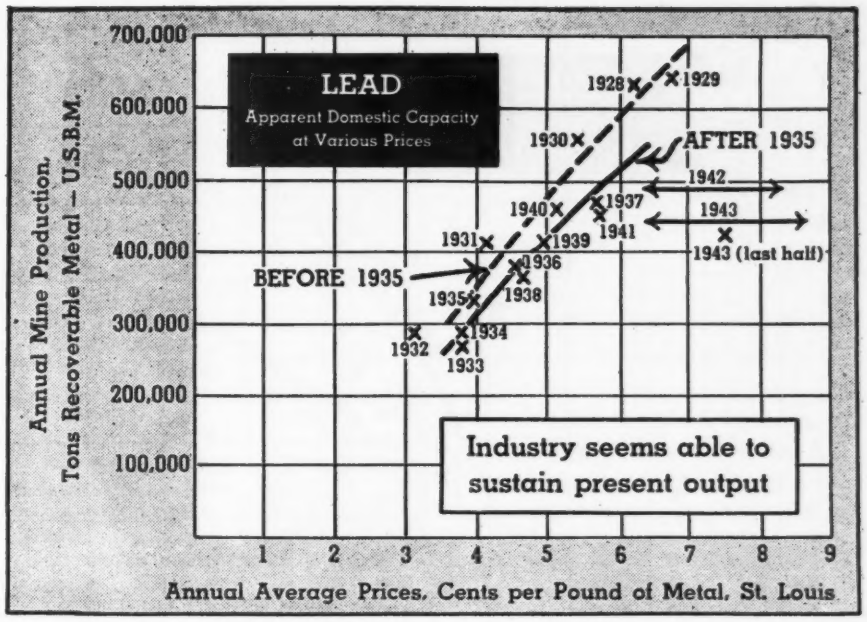
Considering the dearth of important new discoveries in recent decades, it is rather surprising that fifteen years of production have not created more statistical evidence of considerable reductions in capacity. If depletion is as serious as Mr. Batt implies, then there should be a tendency for the more recent points to move downward and to the right. Only on the lead chart is such a tendency indicated, that for copper actually showing an opposite trend. The charts show the surprising tenacity of our important mining districts, and suggest that depletion is not as serious as is commonly assumed.

This does not mean that we can afford to be complacent about the decline in the rate of discoveries. The latter is an unmistakable fact which deserves the most serious search for means of inducing more exploration. Conditions have developed, particularly in the tax field, which make the risks of mineral exploration unattractive, and have forced the mining industry to live off the "fat" accumulated in earlier years. The charts simply suggest that the layer of fat has been thick enough to see us through thus far in good shape. Inasmuch as mining districts do eventually play out, we know that sooner or later depletion will pinch our capacity if something effective is not done to encourage prospecting and development.

It must be kept in mind that, unless phenomenal gains in efficiency are made, the retention of wage scales not comparable to those of the past may project our mineral economies into areas not suggested by the charts. Also, any important change in the purchasing power of dollars will upset the usefulness of the past as a key to the future in terms of price.

Copper Productivity Improved

The copper chart brings out some surprising facts. First of all, in contrast to lead and zinc, and despite the known troubles of the copper producers due to manpower shortages, the relationship of wartime copper prices and premiums to production shows improvement over past performances. This does not mean that the manpower troubles are more imaginary than real. It indicates that the copper producers have been able to increase efficiency enough to overtake both manpower handicaps and the effects of depletion on capacity.



Undoubtedly, an important factor contributing to this praiseworthy result is the circumstance that the bulk of our copper production comes from large open-pit operations, in which aspect mining comes close to manufacturing in its economy. These open pits have been so thoroughly mechanized that relatively small numbers of men account for enormous tonnages. Also, they are able to realize important ore-ton-cost benefits through large-scale operation, which are seldom possible in underground mining. An additional factor, of some consequence in these times, is that, all activities being in plain view, more effective supervision can be maintained.

The chart shows how far above past levels the industry has stepped up its production. It also suggests that the industry would be extinct at a continued price below 6 cents per pound, that a 600,000-ton rate of production is likely to require a price in the neighborhood of 10 to 11 cents, and that a price of 12 cents is likely to produce approximately 750,000 to 800,000 tons per year.

Lead Capacity Remains Good

As stated in the foregoing, the lead chart is the only one on which depletion seems to have affected capacity. This is shown by the circumstance that the years after 1935 seem to develop a separate and lower curve than the prior years. This trend is rather surprising, considering that such benefits as lead received from the 71-cent silver price began in 1933.

On June 2, premium-quota information on the domestic lead industry during the second half of 1943 was released by the War Production Board. This indicated a half year's production of 211,520 tons at an average price of 7.57 cents per pound. The average for A-quota mines, involving 192,626 tons of production, was 7.17 cents per pound, and for B-quota mines, producing 18,894 tons, it was 11.69 cents. The complete table will be published in the news section of our next issue.

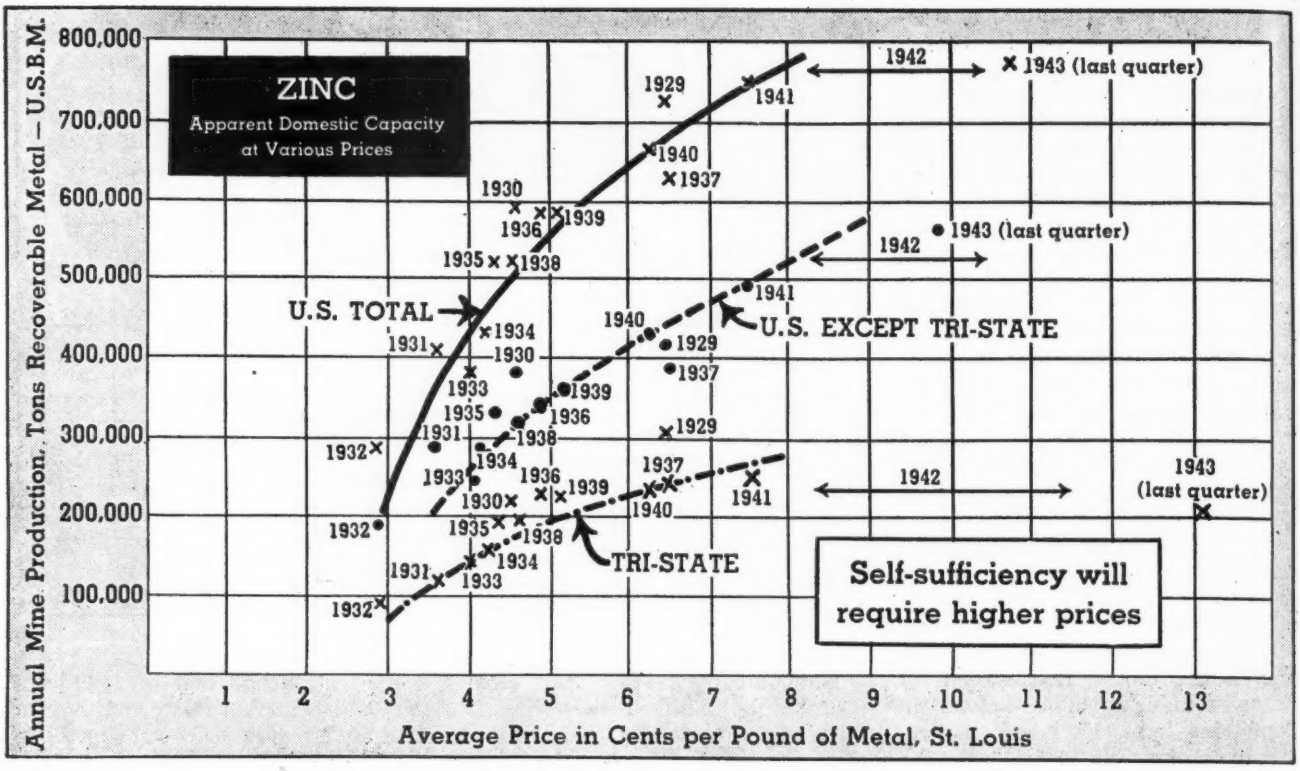
The chart shows that the present rate of production is commensurate with ordinary rates of production. It indicates that the industry would cease to exist at prices near 2½ to 3 cents per pound. For lack of complete information the years 1942 and 1943 are represented by lines; the figure for the last half of 1943, recently received, is specifically shown. The point representing the latter indicates that wartime conditions have dislocated the industry to an extent which makes production cost approximately 2 cents per pound more than what seems to be normal.

The chart suggests that a restoration of equilibrium, if it occurs, should enable the industry to mine approximately 450,000 tons per year at a price around 5½ to 6 cents.

Zinc Statistics a Puzzle

Understanding of the zinc situation is greatly aided by the release of recent figures on average price levels. The curves show that the zinc industry is producing far above its ordinary levels, and that the industry as a whole is dislocated more than copper and lead by wartime conditions.

(Continued on next page)



Comparing 1943 conditions to the curve established during past years, it seems as though the measure of wartime dislocation is about 3 cents per pound. However, when the same comparison is made by splitting the industry into two parts—namely, the Tri-State district and the United States except the Tri-State area—it appears that the Tri-State is dislocated to the extent of 8 cents per pound and that the rest of the country only about 1 cent per pound.

The zinc data, apart from the war years, do not show a particular tendency toward a shift down and to the right, as should be expected if depletion is pinching the industry's capacity to produce. Even in the Tri-State situation the prewar curve shows stability that does not seem to fit the numerous gloomy prophecies that this district will experience a profound slump when subsidies are removed. The curve suggests that the district can expect to produce about 200,000 tons per year at a price of 6 cents per pound.

Such a conclusion is so far out of line with the expectations of parties best informed on Tri-State conditions that it seems as though there must be extraordinary circumstances which demand special care in interpretation. One element in the statistical picture tends to corroborate this view—namely, the great distance between the 1943 position and the curve established by prior performance. This unusual departure cannot be explained by wage changes and labor shortages alone. The Tri-State area has experienced labor shortages, but they are not greatly different from the troubles experienced by metal mining elsewhere. Also, the Tri-State district has been more able than most metal mining districts to make up for labor shortages through mechanization. The explanation seems to be that depletion is overtaking the Tri-State district with extraordinary rapidity. This conclusion must be given particular weight in view of the additional fact that the tailings retreatment operations, which make an important contribution to Tri-State zinc production, have small hopes of surviving the period of subsidy payments unless some unusual forward stride is made in treatment methods.

It is to be hoped that the suggestion of the curve based on past performance is correct and that this old district, which has confounded its gloomy prophets so many times in the past, will do so again.

Because the Tri-State situation introduces special circumstances, it seems necessary to interpret the national situation in the light of dual possibilities applying to Tri-State production. For example, one of the current questions in the minds of zinc producers is the extent to which we can expect to be self-sufficient in zinc at reasonable cost after the war. The figure of 650,000 tons of primary zinc is used simply because it is the most commonly accepted estimate of postwar consumer needs, on the basis of 600,000 tons of slab zinc, 100,000 tons for direct conversion into pigments, less 50,000 tons from secondary sources. If the industry recovers its prewar equilibrium between wages and efficiency, the general curve suggests that domestic mines can produce 650,000 tons per year at about 6½ to 7 cents per pound. If, on the other hand, the Tri-State district must be counted out of the postwar picture, then the curve representing the rest of the country suggests that self-sufficiency may require from 10 to 11 cents per pound. If about one third of the Tri-State potentiality is retained, the curves suggest that a price of 8½ to 9 cents should bring out 650,000 tons of primary zinc.

The curves also suggest that a slump in price to a 6-cent level would reduce primary output to somewhere between 400,000 and 500,000 tons. A continued price at the 3-cent level would apparently drive the industry out of existence, except where zinc is a by-product.

In conclusion, the reader is cautioned against either overvaluation or undervaluation of the data presented as a means of estimating our future potentialities in copper, zinc, and lead. They afford no basis for solid conclusions; however, they do demonstrate the sensitivity of production to price, and that, with the possible exception of the Tri-State district, there is more vitality left in our metal mines than men in public life seem inclined to believe.

South Dakota Manganese A Reserve for the Future

E. T. CASLER, *now Assistant Manager, Florida Phosphate Division, and* DR. I. M. LE BARON, *now Chief of Ore Dressing, Research Division, International Minerals & Chemical Corporation, Chicago, Ill.*

Requested by Metals Reserve Company to find a way of mining, recovering, and storing the manganese nodules that occur so abundantly in the much-discussed deposits at Chamberlain, S. D., International Minerals & Chemical Corporation organized the research project which, with its results, is summarized here. The task is closely akin to that of mining phosphate in the Florida pebble field, where International has had vast experience. The result of experimental work is noteworthy despite MRC's decision that manganese from this source is not needed at present.

THANKS TO ITS IMMENSE SIZE, the manganese deposit which stretches for miles along the Missouri River near Chamberlain, S. D., has attracted much attention despite its low-grade character. This manganese, which occurs in the form of impure nodules in a clay-shale matrix, would provide an almost inexhaustible supply could it be recovered at a cost that would permit it to compete with manganese from other sources.

Separation of the nodules from the matrix has been the subject of study for years. When the war emergency arose, new interest was aroused, due to the demand for manganese. On Sept. 8, 1942, International Minerals & Chemical Corporation, represented by Louis Ware, president, contracted with Metals Reserve Co. to develop a means of separating the nodules economically and to design a plant and submit a report. MRC would then decide whether the need for manganese would justify International in proceeding to build and operate a plant large enough to stockpile at least 300,000 tons of nodules a year. The concentration ratio being 25 to 1, this would mean mining 7,500,000 tons of matrix annually.

The project, thus outlined, was undertaken soon afterwards by International and was completed by Dec. 5 in that year, and the report, now released, was in the hands of Metals Reserve by Jan. 15 following. The entire cost of this research project was 30 percent less than the approved budget allowance.

International's final estimate as to the cost, erected, of the plant considered was $5,593,521, including land, buildings, improvements, equipment, installation, and service fees, as well as automotive equipment for the mine. Its estimate of operating cost, exclusive of overhead, fees, and depreciation, was $2.82 per ton of recovered nodules.

When the work had been completed, however, and the report submitted, the national situation, in the opinion of MRC, did not warrant further expansion of production of manganese in the United States, and it was decided to hold the Chamberlain project in abeyance until conditions might warrant the mining of this low-grade ore.

Despite this decision, the experimental work is of interest because of the questions that have been raised in the last 15 years as to the feasibility of exploiting this resource.

In organizing a manganese department for the Chamberlain project, Mr. Ware elected to have it operate as part of International's phosphate division, under Franklin Farley, vice president, with James A. Barr, chief engineer of the company, and Dr. P. D. V. Manning, director of research, in charge of engineering and research respectively. At Chamberlain, E. T. Casler, senior author, was in charge of the project as project engineer, and Dr. I. Milton LeBaron, research metallurgist, supervised the research work. H. K. Mather, of Mitchell, S. D., served as chief of the survey party.

Prior to the engagement of International for this project, the Bureau of Mines had been studying the problem for some time and had built a pilot plant. Operation of this plant had ceased just before the International personnel arrived. Inasmuch as it had been agreed that the Bureau's installation would be available, the mine and plant were put in operation again on Oct. 5, the same year.

Miles of Outcrops

The manganiferous nodules are found in horizontal beds of shale 18 to 36 ft. deep. These deposits outcrop for miles north and south of Chamberlain. By drilling, the seam has been traced back under the prairie, where it is covered with several hundred feet of overburden. At certain points, several miles of ore outcrops are exposed in relatively concentrated areas. Here also additional large tonnages of matrix can be made available by stripping up to about 40 ft. of overburden.

Matrix, or ore, may be dug by large

shovels without blasting. When excavated, it breaks along jointing planes into readily handled irregular blocks.

Prospecting data were obtained from the Bureau of Mines from shafts of the General Manganese Corporation (previously on the ground) and from such metallurgical data as were yielded by the operation of the pilot plant. Time being short, it was agreed to survey only an area sufficient to assure a supply of manganese for the national emergency. Results showed 182,445,477 short tons of ore containing 11,274,494 short tons of nodules. Overburden to 20 ft. depth totaled 22,366,900 cu.yd.

A mining reserve of 59,679,400 tons of ore was blocked out. This would permit the recovery of 2,387,176 tons of nodules, and would supply the proposed plant for seven years. The plant site was chosen, in the center of the reserves, on the west side of the river, about 2 miles from Chamberlain.

Mining in open cut with power shovels and a combination of truck and conveyor transportation systems was recommended. To concentrate mining and reduce length of haul, shallow stripping was to be co-ordinated with the mining. A tub-mounted, 6-cu.yd. walking electric dragline having a 160-ft. boom would expose the ore in a longitudinal cut along the outcrop edge, disposing of the waste in ridges paralleling the pits. Later, after the ore had been mined from the outcrop, a second and sometimes a third cut of overburden would be piled in parallel strips in the space previously mined. Tractors and scrapers would be used on isolated areas having shallow cover.

Mining would be done with 5-cu.yd. crawler-mounted electric shovels advancing away from the plant in a cut 60-ft. wide following the contour. The open pit behind the shovel would serve for transport. Two pits would be worked.

Diesel trucks, 35-ton, operating on the pit floor, would transport the ore within economical distances. Sixteen of them would serve the two shovels. The ore, when wet, becomes greasy, necessitating good roads to loading points. The bottom of the ore is almost level. As mining advanced away from the plant, conveyors would be installed across the depressions to shortcut the haul.

Estimated cost of mining, 9.61c. per ton of ore and $1.92 per ton of nodules, is broken down in a table. The estimated first cost of the equipment required for stripping, mining, and transport was $912,500.

Metallurgically, the orebody at Chamberlain is composed of hard nodules, soft nodules, blue clay (shale), light-brown clay (shale), dark clay (shale), bentonite, and marl.

The hard nodules make up 5 to 8 percent of the orebody. They vary in size around Chamberlain from 8 in. down to small mesh. (In other sections much larger ones have been observed.) They will vary from 10 to 25 percent in manganese. Two representative analyses follow:

I		II	
	%		%
Mn	18.1	$MnCO_3$	*38.77
Fe	12.4	MnO_2	2.81
CaO	12.0	SiO_2	5.09
MgO	2.5	Fe_2O_3	10.50
SiO_2	11.0	Al_2O_3	1.14
Al^3O^3	2.5	$Ca_3(PO_4)_2$	2.25
P	0.5	$Ca\,CO_3$	22.34
S	0.05	$MgCO_4$	7.28
CO_2	28.0	SO_4	0.12

* Equivalent to 18.54 percent Mn.

An average value for the manganese content from the daily nodule analyses made at Chamberlain during our operation is 16 percent.

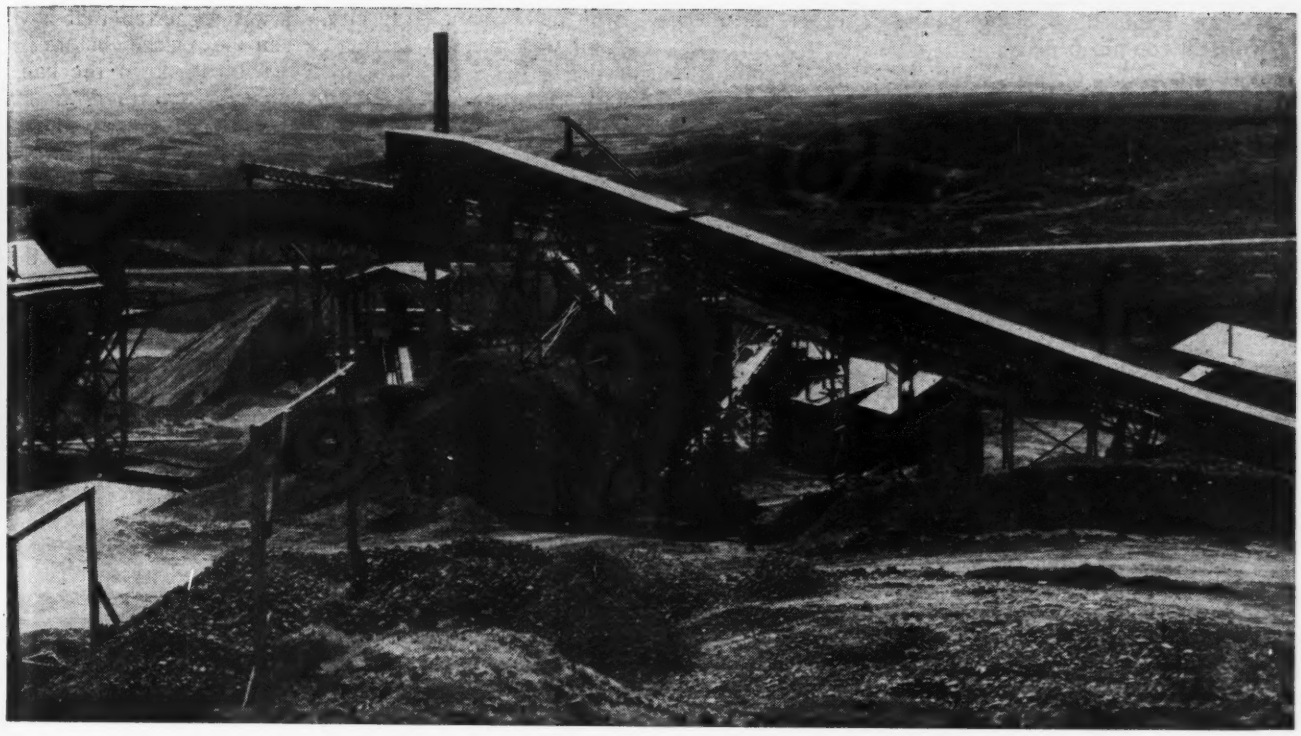
Study of available data indicates that the nodules are made up of a fine-grained brownish or yellowish matrix of undetermined nature which contains the manganese. This is surrounded by veins of calcium carbonate, containing ferrous carbonate. Extremely fine grinding is indicated for liberation.

The minerals composing the hard nodules are mostly carbonates. These nodules show no definite crystalline form, fracture unevenly, and in hardness are between 4 and 5. They appear to be built around a fossil or shell nucleus. They average 2.45 specific gravity. Their manganese content constitutes the greatest percentage of manganese in the orebody which may be economically recovered without leaching.

Estimated Mining Cost

* Exclusive of depreciation, royalties, and overhead

	*Per Ton Ore	*Per Ton Nodule
Drainage	$0.0010	$0.0200
Dragline stripping	0.0140	0.2800
Auxiliary stripping	0.0020	0.0400
Mining shovel loading	0.0121	0.2420
Truck operation	0.0540	1.0800
Roads	0.0060	0.1200
Conveyors	0.0060	0.1200
Stockpiling	0.0010	0.0200
	$0.0961	$1.9220



THE U. S. BUREAU OF MINES studied the beneficiation of South Dakota's manganese ores in this pilot plant near Chamberlain, S. D. It was later taken over and operated by International

The soft nodules, in contrast, appear to have been laid down as a mixture of clay and carbonate. Manganese content and specific gravity will vary with the clay. These nodules make up a small part of the nodular content of the deposits examined. Only a small fraction can be classified as recoverable without leaching.

About 90 percent of the matrix of the orebody is a clay or shale. Half is shot with horizontal fracture planes along which a blue material, containing 1 to 1.8 percent manganese, has been deposited. This clay has an average specific gravity of 1.89 and 20 to 25 percent moisture, and is wet when mined. A small part of the bed is a light-brown clay containing about 0.7 percent manganese and of the same specific gravity as the clay matrix. Much of the clay matrix is a dark, so-called barren shale, running 0.1 and 0.6 percent manganese. Otherwise it is the same as the blue clay.

Layers of bentonite, from 1 in. to 2 ft. thick, occur throughout the deposit. Not more than 5 percent of any outcrop will be composed of it. Specific gravity averages 1.76.

Beneath the manganiferous deposit is a variable thickness of marl. Mining would probably stop here.

A Bureau of Mines study indicates that a nodule content of 6.5 percent could be recovered by careful hand picking. Average weight per cubic foot of ore was 125 lb., without considering voids.

These data indicate that the ore will weigh 1.69 short tons per cubic yard, giving 210 lb. of recoverable nodules per cubic yard. This is 9.6 cu.yd. of ore per short ton of nodules or, in round figures, 10 cu.yd. For a maximum of 1,000 tons of nodules per day this would mean mining approximately 16,200 tons of ore per day with 100 percent recovery. For 80 percent recovery, it would be necessary to mine about 21,000 tons, or 12,500 cu.yd., of ore per day.

On small trucks the swellage measured was between 50 and 56 percent. Actual figure would be nearer 45 to 50 percent.

Results of Hand-Picking

After the ore has been crushed to 6 in. the percent of nodules locked in the clay matrix will be small for nodule sizes down to 0.1 in. in diameter. Three screen analyses were made on material from three locations. The smallest sample was 1,600 lb. The nodules were hand-picked down to 0.093 in. in diameter. The greatest frequency distribution is in the 1½- to 2-in. size. Only a small fraction considered recoverable mechanically are below ⅛ in. in diameter. In the part of the deposit examined few nodules will not pass a 4-in. screen.

The Bureau's plant was operated by International for two months, six days per week, and a cost analysis prepared. Cost per long ton of nodules was $9.30 for October and $9.77 for November, exclusive of overhead and depreciation.

Cost of hand-picking labor alone per short ton of nodules increased from 86c. for plus-2½-in. size to $1.98 for minus-2½-in. plus-1½- in. and to $5.26 for minus-1½-in. The average was $1.96.

Cost data showed that a mining and milling cost of $9.30 per ton of nodules would be probable for a hand-picking operation. A maximum of 4 percent of the ore would be recovered as nodules, containing 30 percent of the total manganese.

As to probable recovery, analyses of the orebody run from 1.77 to 2.5 percent Mn, averaging 2.31 percent. Between 5 and 8 percent of the nodules appear to be larger than 0.1 in. in diameter. Using 6.5 percent as an average and 16.1 percent Mn as the content of the nodules, 1.05 percent Mn out of the original 2.31 percent should be recovered. This is about 45.3 percent of the manganese content. Hand picking recovers about 65 percent of this percentage of manganese.

The clay as removed runs 20 to 25 percent moisture, wet basis. On exposure it decreases until after a month it is around 6 percent during dry

weather. Exposed for long periods it will still contain 6 percent.

As the moisture decreases, the clay shrinks, breaking at numerous fracture planes. After two weeks' exposure, it is friable and the nodules may be screened out. This is feasible for a small operation. However, when the material is spread out 2 ft. deep, it will slake only to a 6 in. depth over a period of weeks. After 12 days the surface has lost all the moisture it will lose thus. The tremendous area necessary for spreading 6 in. deep, together with the cost, rules out such an operation on a large scale.

Kiln Operation Costly

This study makes it obvious that a kiln operation would give good disintegration, leaving the hard nodules easy to recover. A kiln pilot plant had been installed by the Bureau. Additional recovery over straight hand-picking did not justify the higher cost. The kiln, however, was operated by International, but the net finding was that it would be too costly.

Possibilities of gravity separation had been explored by the Bureau. Among the methods tried were tabling, jigging, and heavy liquid cone separation. Preliminary results on small laboratory equipment did not look promising for tabling and jigging, so investigation of these was stopped. A Harz-type jig was used. Cone separation gave better promise.

Our studies of the ore, both as mined and in water, indicated a possible close analogy between the separation of coal from slate and bone and the gravity separation of the Chamberlain ore. The gravities involved are somewhat higher, thus making the separation slightly more difficult, but good results are being obtained on large-scale coal separations that are fully as difficult. With the ore the heavier material (the nodules) would be the concentrate.

Results were obtained in tests indicating that the operation would be a straightforward separation if either jigs or gravity cone were used. Experts in the specialized field of coal cleaning were consulted and concurred in our opinion that the cheaper jigging would serve excellently.

To determine quickly the feasibility of jigging, we obtained a laboratory model of the Jeffrey diaphragm jig, having 1x4-ft. screen area and using a jigging stroke of the Baum type, from Battelle Memorial Institute. Byron M. Bird, of that organization, undertook to supervise the experimental work with it. The pilot plant consisted of a bin, an apron feeder, and the jig. After preliminary tests a three-day test run was made. Jig size limited the feed size to 1¼x0 in. Results were:

Total feed, lb.	87,945
Rate of feed, tons, per hr.	2.5 to 3
Size of feed, in.	1¼x0
Average % nodules, feed	3.37
Average % nodules, tails	0.983
Weight of concentrate, lb.	2,351
Average % clay, concentrate	7.5
% Mn in concentrates	15.5
% Recovery on basis of concentrates (no allowance for clay)	79.3
% Recovery on basis of concentrates (allowance for clay)..	73.35
% Recovery on basis of nodules in tails..	70.8

Since the jig used only one compartment instead of three, and for the reason that the adjustability was not such as could be obtained from a commercial jig, one may assume that better results could be had in large-scale operation.

In the pilot plant the jig would handle a feed only up to 1¼x0 in. and maintain efficiency. It was decided to jig an unsized feed 6x0 in. The specific gravity differences are as good as exist in a number of coal operations where large size ranges are being jigged successfully. The screen analysis of the crude ore is favorable. In jigging an unsized feed, the entire screen scale should show a reasonably uniform percentage of the different sizes, with no sudden breaks at any point. The crude ore received from the hammer mill conformed to this requirement, and it is evident that the screen analysis of this ore can be controlled without difficulty. These are the two basic requirements for the crude ore, and if they are met, experience indicates that jigs will work.

The hutch product containing most of the minus-¼-in. nodules and some clay was not clean. In actual operation a clean product may be obtained. If not, the loss would be only about 2.5 percent of the total recoverable nodules. Possibly the hutch product could be handled economically by tabling.

The clay forms a gummy mass when wet. The effect on jigging was investigated by wetting down a truckload. Feeding was difficult, indicating that good bins would be necessary. The jig was not able to continue at its capacity of about 3 tons per hour, but worked satisfactorily at reduced capacity. It was suggested that a vibrating screen be placed before it, with sprays to break down the balls.

During freezing weather frozen lumps were fairly common. These were broken apart by the jig action for the most part. The warmer the make-up water, the less important this would become.

Recirculation of as much of the water used in jigging as possible would be necessary. A day's run indicated that clay would not build up unduly.

As the clay contains a variable amount of manganese, as do the nodules, jig control could not be based on chemical analysis for manganese. It must be based upon the recovery of nodules themselves, to be determined by careful hand-picking. More practical for small sizes would be float-sink tests such as used in the coal industry.

Milling Cost 90 Cents

Results of the investigations indicated clearly that separation should be made by an unsized (6x0-in.) jigging operation. This operation would be low cost, with a simple flowsheet. Maintenance would be low. The chief cost would be for recirculating the water for the jigging.

Cost of power, labor, and maintenance for milling, including crushing of ore and disposal of tails, is as follows:

Estimated Cost per Ton of Nodules

Power	
Mill	$0.08
Waste disposal	0.08
Concentrate stacker	0.03
Pumping makeup water....	0.06
	$0.25
Labor	0.25
Maintenance	0.40
Total	$0.90

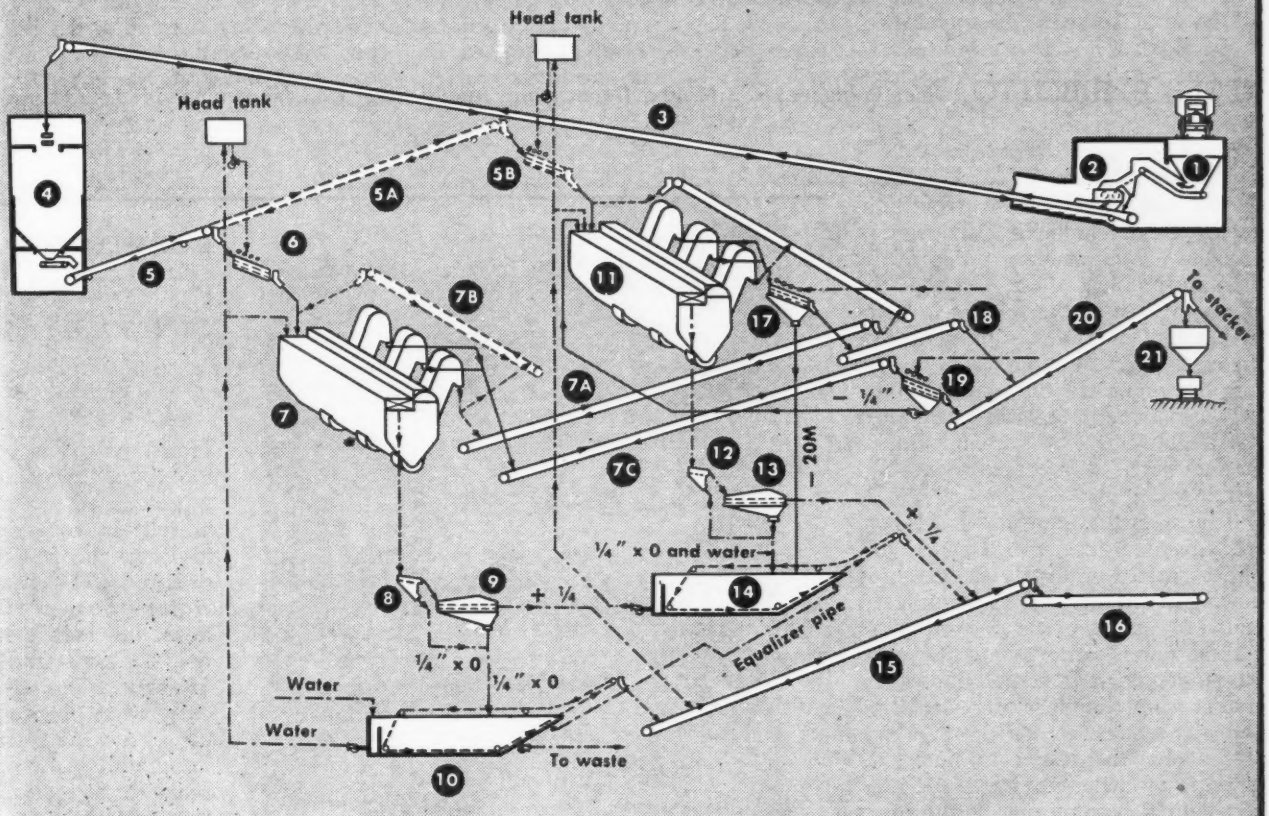
The proposed general flowsheet, based on 300-day operation, is shown. Two options should be incorporated in the final flowsheet, to insure best possible grade and recovery:

Option 1—For each jig, concentrates from compartments one and two should go to concentrate belt. Concentrates from compartment three should return to jig feed and recirculate.

Option 2—Concentrates from the first and second compartments of each of the first three jigs should go to the concentrate belt. Concentrates from the third compartment of the first three jigs should constitute the feed for the fourth jig. Concentrates from the first two compartments of No. 4 jig should go to the fine de-

FLOW DIAGRAM OF MANGANESE CONCENTRATING PLANT

(Recommended by International Minerals & Chemical Corporation for recovering manganese nodules from deposits at Chamberlain, South Dakota)



LEGEND

1. Truck hopper and apron feeder
2. Double-roll crusher following 6-in. bar screen
3. 6x0-in. raw-ore belt conveyor
4. Four 500-ton pockets, conveyor above, feeder below
5. Three 6x0-in. belt conveyors

5A. Alternate single conveyor from No. 4 pocket to No. 4 jig

5B. Disintegrating vibrating screen, alternate, with sprays

6. Three disintegrating vibrating screens, with sprays; 500 g.p.m. to sprays at 100 p.s.i. by pump from head tank
7. Three primary jigs. Each an 84-in. Jeffrey Baum-type

7A. Middlings conveyor

7B. Alternate middlings conveyor

7C. Concentrates belt conveyor

8. Three fixed screens
9. Three vibrating draining screens, + ¼ in. total
10. Three fine tailings recovery tanks. Make-up water added
11. Re-treatment jig or No. 4 alternate; 84-in Jeffrey Baum-type
12. Fixed screen
13. Vibrating draining screen
14. Fine tailings recovery tank
15. Tailings belt conveyor
16. Stacker
17. Rinsing vibrator screen, with sprays
18. Re-treated concentrates conveyor
19. Rinsing vibrator screen, with sprays above and pump beneath
20. Final concentrates conveyor
21. Bin and railroad car

watering screen and then to the stacker belt. The third compartment would recirculate. Undersize from the concentrate washing screen from the first three jigs would also feed to the fourth jig.

Concentrates as they come out of elevator would contain the hutch product, which would not be up to grade and would be removed by the washing screen. Containing enough values to warrant recovery, it would be returned to the feed of the fourth jig, which would have a small-size screen plate. Concentrates from here would go over a separate fine (20-mesh) dewatering and washing screen. This type of flowsheet should give optimum recovery, probably yielding a good 6 percent more of the values than would the straight flowsheet. If operation should indicate that the cost is prohibitive, the straight flowsheet could be used.

Mr. Bird, in his report, recommended that a Baum-type jig of the most flexible type be used; in particular, one allowing great latitude in the type of stroke.

There would be a tremendous tonnage of tailings for disposal. The best plan would appear to be to use a stacker to pile them when dewatered. A 48-in. conveyor system 3,000 to 4,000 ft. long would take care of the first six months of operation.

How to Approach the Mine Drainage Problem

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OFTEN THE MOST VITAL FACTOR influencing the development and operation of many of our modern mines is the drainage problem. The fact that the advancing age of the mining industry in the United States is bringing this drainage problem more often to the fore has prompted the writer to offer a systematic approach to controlling the bothersome surface and underground waters so frequently encountered.

The surface waters discussed here are separated into two kinds: (1) direct surface waters such as those flowing in streams and resting in lakes; and (2) indirect surface waters or ground waters lying within the overburden material. Underground waters consist wholly of the waters occurring below the ledge elevation. It is important for the reader to note that any one of these types of waters can very simply become one of the other types.

EXAMPLES OF SURFACE WATER CONTROL

Floating in the bottom of this surface cave is a pump which is intended to keep the bottom drained. The more water removed here, the less there will be underground. The subsidence is progressing toward the deep-well pump marked by the distant tripod

Controlling, Diverting, Sealing Off Surface Waters

More and more mining companies are realizing the simple fact that it should be cheaper as a rule to catch a certain quantity of water at surface, rather than to permit this water to make its way to an underground sump and thence be pumped to surface. The progress of this thought has led to some interesting schemes of surface-water control.

Control of Inflows from Direct Surface Waters

Obviously, it is often difficult to ascertain whether direct surface waters are seeping underground in excessive quantities. In the case of streams, weirs placed at intervals along each channel furnish an excellent means of detecting seepage. The flow of tributary streams must, of course, be considered. When observations show that there is seepage between weirs, the troublesome area can be narrowed down by constructing intermediate weirs and repeating the observations. When the seepage zone is found, suitable control measures, as discussed herein in a following commentary, may be taken.

In comparatively stagnant bodies of water, such as ponds or lakes, ascertaining whether seepage is taking place becomes more difficult. A substantial seepage may be detected by a careful weir study of inlets and outlets combined with rainfall and evaporation observations. Under some conditions, it must simply be inferred that seepage is occurring because of the nature of underground flows.

The use of chemicals and dyes, such as fluorescein or uranin, is often helpful in tracing the flow of waters in either streams or lakes.

Since inflows from direct surface waters are generally localized within small areas, there are relatively simple expedients for controlling these flows. These may be: (1) diversion and drainage ditches, (2) fluming, or (3) use of slimes or clays for sealing crevices. Some direct surface flows are only periodic in nature, as with floods. These may be held in check by dams, levees, and other familiar methods of flood control.

Diversion and drainage ditches: Again referring to streams alone, diversion is the surest method of eliminating seepage. However, the cost of such a project is not always in its favor. If alternatives are permissible, they should be investigated fully before diversion is attempted. In subsiding areas there is no alternative but to divert streams flowing over the affected region. Stream diversion is most to be recommended when it furnishes a permanent and complete solution to a particular drainage problem. The efficacy of stream diversion can be improved by driving sheet-piling to ledge on the seepage side of the ditch.

Seepage from ponds and lakes can be eliminated by draining the body of water completely. This may be done either through a drainage ditch or by pumping the water to some distant point.

Fluming: Fluming is desirable in streams where the seepage area is not moving or subsiding. In such cases, fluming is to be preferred to diversion because of the difference in cost. Flumes may vary in design from heavy concrete mats resting on the stream bed to elevated steel channels. Concreting is feasible only where the broken areas are few and small. A combination of diversion and fluming may be used in some cases.

Use of slimes and clays: New developments in the chemical industry have encouraged the use of various slimes or clays in sealing off porous and leaking stream or lake beds. Since the cost of such methods is comparatively small, it is wise to investigate their possibilities before resorting to diversion or fluming.

The materials used for sealing porous beds need not be commercial products. Oftentimes local byproducts or waste products, such as flotation slimes, may be used. At some properties there is a natural sealing process where streams carry silty and slimy mine or mill waters. Flotation slimes of favorable character may be used either directly on a stream bed or pumped into drill holes in the broken zone. The effectiveness of the slimes depends on the familiar packing effect of many small-mesh materials.

The clay ordinarily used for sealing off waters is some commercial form of bentonite, a clay that has the unique property of being able to absorb many times its own weight in water and to swell up to 15 times its original size in the process. The bentonite may be applied by simply sprinkling it over the lake or stream bed. The sucking action of the water going down into cracks quickly draws the clay down before expansion occurs. Since the bentonite does not set or harden, it continues as an effective sealing agent even with movement of the fractured zone.

Cement grouting may be successfully used in sealing off porous measures, but the process is expensive. In some cases a mixture of cement grout with clay or slime is effective and decreases the cost somewhat.

Diversion ditches such as this (at left) remove surface waters which might otherwise seep underground in excessive quantities if allowed to pursue their normal course

A deep-well pump (right) is lowering the level of water in the overburden above the ledge. Such water can easily find its way into the mine

Control of Inflows from Indirect Surface Waters

When water seeps into underground workings from extensive areas within the overburden material, the only obvious method of control is to attempt to drain the overburden to ledge. Any program of this nature will probably be long and expensive, with results frequently uncertain.

A large surface area may be partly drained by excavating a few ditches through the area. This scheme must be followed by a deep-well pumping program.

Outlining a deep-well pumping program: The major problem arising in a deep-well program is that of placing each well in a most favorable position. A good deep well must satisfy three conditions: (1) It must be situated where it will intersect a good aquifer in the overburden; (2) it must intercept waters entering the mine; and (3) it must continuously lower the water table. A good well can give both long-term and short-term results; it can lower the water table so as eventually to drain the area to ledge, and prevent local inflows of water to the working places in the mine.

Before a single deep well can be sunk, then, it is necessary to gather information about the area in question. This information should consist of surface contour maps, ledge contour maps, water-table contour maps, and logs of the overburden material. The ledge contour map is made up from data obtained by test-hole drilling, mine exploration drilling, and, possibly, electrical resistivity surveys. Any test holes that are drilled will also furnish logs of the overburden material.

At present test-holing offers the most effective means of locating suitable aquifers. Continued improvements in geophysical methods of soil study may some day eliminate most of the test-holing now necessary.

Data for the water-table contour map are obtained from water measurements in wells and drill holes.

A well is located on the basis of the data discussed. It should be in a low area in the ledge where the water table is known to flow toward

the mine workings. In addition, it should be located in an aquifer, as has been mentioned.

Recording and Interpreting Surface Water-Control Results

For a successful water-control program it is essential to employ an accurate scheme of recording and interpreting results. Routine measurements must be taken at all weirs and pumps. Adequate graphs and charts should be made from the data thus obtained. New ledge contour maps and water-table contour maps should be made as new information is obtained.

Besides the regular measurements on operating equipment, there are certain field tests which are applicable under many conditions. Regular tests can be made with the previously mentioned dyes to chart the movements of waters. By such tests it is possible to chart the movement from one well to another and from the surface to underground.

Eliminating and Controlling Underground Waters

The control of underground waters is not a new problem; it is as old as the oldest mining operations. The problem is being made simpler by progress in methods of surface control. New developments and approaches to underground water control are, therefore, not common.

Underground waters may be divided into: (1) Those occurring in shaft sinking and (2) those occurring in drifting and mining.

Water Occurring in Shaft Sinking:

Sinking in overburden material: That portion of a shaft above the ledge most often produces the difficult water problems. The methods for sinking shafts in overburden materials are well known. They range from the construction of linings in the shaft as work progresses to the use of a pneumatic caisson. The pneumatic caisson offers the most reliable method for sinking a shaft in water-soaked overburden.

Freezing of a soft, water-bearing soil preparatory to sinking has not been a popular approach in the United States.

In all operations involving sinking in water-bearing overburdens, the essential climax is that the water be sealed off effectively at the ledge contact. A solid concrete wall down to ledge furnishes a satisfactory seal. At the ledge contact it is wise to pump grout into drill holes in the rock. Oftentimes it is advisable to go back to the concreted portion of the shaft above the ledge and pump grout into holes in cracked areas.

Sinking in rock: Water occurring in rock shafts may be controlled by (1) the use of water rings, (2) diverting dripping water into intermediate reservoirs in the shaft, (3) grouting local fissures carrying water, or (4) lining wet portions of the shaft with an impervious material, such as concrete.

A water ring is a small groove cut around to shaft walls to act as a miniature sump. Corrugated iron sheets and splashboards may be used in conjunction with water rings to gather water to central pumping stations in the shaft.

The various means of controlling shaft waters aim either to keep the water out of the shaft entirely or to localize the flows. The water finally reaching the shaft bottom is removed by some type of pneumatic pump.

Water Occurring in Drifting and Mining

In the final analysis, most operators will tolerate considerable flows of underground water if this water does not hamper mining operations and thereby greatly increase the cost of mining. This means, in general, that waters flowing through orebodies are less desirable than waters flowing through barren formations.

Water encountered in drifting operations, then, is readily handled except in the case of unusually large flows.

★ ★ ★ ★

COMING SOON
by the same author

Handling Water Problems At Inland's Morris Mine

A program of water control that is in many ways unprecedented in mining history will be discussed in detail by Mr. Ribotto in a forthcoming issue.

★ ★ ★ ★

In mining, it is generally necessary to make an effort to keep the water out of the ore area. Measures for accomplishing this vary for each mine and also for each working place in a mine. Simple methods of control can usually be left to the ingenuity of the miners and their foreman. An example of some schemes for controlling water in the mining places is given in a subsequent article.

Recording and Interpreting Underground Water Control Results

The modern approach to controlling underground waters should put considerable weight on recording accurately the results of the control methods. Naturally enough, since pumping is the major method for control of underground waters, a good pumping record should be kept. This may be done by two methods: (1) by recording the operating time of the pump and multiplying by its capacity to obtain the total quantity of water pumped and (2) by regularly measuring weirs at the entrance to the sump to obtain the rate of water flow.

Actual capacity of a pump is nearly always less than its rated capacity. The actual capacity, therefore, should be determined occasionally to insure accurate measurements.

The weirs at each level should either be equipped with automatic recording devices or else should be read at frequent intervals by some competent person. Except in mines where the water flow is very uniform, the results obtained from reading weirs without the use of automatic recorders is, at best, only approximate.

The results of underground pumping and weir records should be coordinated with all other water measurements, both surface and underground. The possibilities in weir investigations are particularly promising. Weirs can be placed throughout a mine to record small changes in water flow. These studies will aid in tracing the movement of water from surface to underground, and they will give evidence of how the mining is affecting the inflow of water.

The correlation of all surface and underground data shows the accomplishments of a control program and furnishes the vital information needed for the next steps in the program.

How Our Readers View the Future of Gold and Silver

IN THE INTRODUCTION to *"What's Ahead for Gold and Silver Money," published in the March issue, comment from readers was invited. Here are typical samples of the response. The majority expect gold to increase in price; some want the price to remain steady. Most of them favor bimetallism. Monetary experts appear to have few admirers. Also, to paraphrase the fireside chats, "there are those" who scoff at E.&M.J.'s efforts to serve.*

Insolvency Buttresses the Historical Trend of Gold

The Editor:

This gold problem—perhaps not problem, but rather normal growth of a unique commodity into its peculiar office as an international necessity—has always had to my mind a seldom-mentioned angle that I believe functions ponderously though silently in the value appreciation of the commodity. I refer to the increment in demand for gold as the world indulges in recurrent orgies of ever more disastrous wars, ever vaster destructions of accumulated wealth, and the astronomical piling of debts upon debts that never are, never can be, paid. After each and every war, in the face of vaster and vaster demands for rehabilitation capital by bankrupt peoples (this time perhaps a cool half trillion) more and more credit—from somewhere—is involved. And CREDIT means metal reserves, some solid base on which national and international responsibility can be measured, protected, thrown into the maelstrom.

If any better commodity than gold can be found, that new commodity would be used we can be sure, but the history of man discloses no such better metal or commodity, for measurement purposes. Therefore a powerful, inexorable, hidden process goes on, and onward marches the intrinsic, chartalistic, bed-rock value of the metal that will perform the sorry world function. This, entirely aside from the commodity attribute of the medium.

I have begun to feel that the blunder into a long overdue higher valuation of gold stopped short of the mark. Gold today is, and a long time ago was, worth probably more than $35 an ounce—by every quality that gives it value. How much more—who can know? But apparently its inherent value is being added to a-plenty, in this second World War.

To me there appears remote prospect indeed of a backward slip in its price, value, or useful work that it must do—instead, every likelihood that its dollar value will climb higher and higher, in due course.

G. C. RIDDELL

Washington, D. C.

Wants Bimetallism and Indirect Repudiation

The Editor:

The article in your March issue on "Gold and Silver Money" was most instructive.

I think that the currencies of the world have really been in a "chaotic state" ever since 1914 and that continuous fluctuations of foreign exchange substantially contributed to economic discord and hastened the present conflict. It is to be sincerely hoped that any postwar treaties creating a league or association of nations will establish a system of managed currency based upon reserves and coinage of the only two metals to which "time honored tradition" has given universally accepted value. Paper promises-to-pay often become worthless, while in certain foreign countries ever our own paper currency is today passing at a substantial discount, although our gold pieces—when obtainable—have a value of $40 or more per ounce.

I question your statement that "considering the volume of modern trade there is not enough monetary metal in the world to establish a genuine hard money system without putting prices on these metals that would be utterly fantastic." Prior to the first World War the leading nations were practically on a hard money system, since it was always possible to redeem a Treasury or bank note in gold or silver. The total stock of monetary gold is nearly one billion ounces and of monetary silver some six billion ounces. As far as I can learn, the total circulating currency of the world is equivalent to less than forty billion United States dollars, so that there appears to be ample metal to cover all currency requirements and—if that could be fairly distributed—all nations would be able to return to hard money. The rub, of course, lies in the distribution, but a good start may be made through promptly coining and circulating, both at home and abroad, just as much of our "sterile hoard" as can be turned loose without causing undue inflation; tending also to establish our own dollar or eagle as the international coin of the future in place of "bancor" or "unitas."

Mr. Hardy's statement that "paper standards (of value) *may* be so managed as to give better results than a metallic standard" rests on no historical basis. Conceivably all human affairs *might* be so managed that there would be no more wars, poverty, or crime, but such management has never yet been forthcoming, nor has the establishment of any money standard other than gold or silver ever failed to result in depreciation of currency.

Silver should doubtless figure in future international currency, since stocks and production of gold are confined to so few nations. The relative value of the two metals is a complicated subject, but there is no logical reason why the United States should pay a bonus price for silver whenever the time comes to discontinue all subsidies on domestic products.

As to the future value of gold—to which the value of monetary silver should be tied—it seems to me that you have neglected the factor of present and probable future inflation. Since 1939 there has been a rise in the cost of living amounting in the United States to from 23 to 42 percent according to various estimates; to some 60 percent in England and to far more in most other countries. Production costs applicable to mining have increased proportionately, so that mines which produce gold for an over-all cost of say $30 per ounce could not profitably resume production unless that metal could now be sold for about $50 an ounce.

We should give serious thought to the application of seignorage to help in

the payment of national debts which have already reached astronomical figures. I do not believe that the people of the United States will ever repay some 300 billion dollars by any usual method of taxation. This would involve unheard of peacetime sacrifices extending over several generations, hamstringing our industrial recovery and ability to assist in the rehabilitation of other countries. If nations must choose between a partial repudiation of national debts or meeting them through marking up the dollar value of our gold and thus creating new money —fiat money if you please—I believe that the latter method is the better and more honest. Revaluation of gold in 1934 caused no serious business disturbance and it is a matter of record that in 1940 our 59¢. dollar purchased 15 or 20 percent more in commodities than the 100¢. dollar of 1929.

Another similar procedure would involve no questions of morality or law that have not been definitely settled, and it is therefore purely an economic problem.

With reservations in respect to future metal values and seignorage, I heartily agree with your article and earnestly hope that the men of the mining industry will bestir themselves toward influencing public opinion along lines which you have indicated.

G. M. Colvocoresses

Phoenix, Ariz.

Gold in Jeopardy Unless Silver Is Restored

The Editor:

We hear much in support of the gold standard. And we have seen the gold standard in some marked mutations, with gold beginning with a long-standing value of $20.67 a troy ounce, then with the brushing of a sleeve over a silk hat a time or two, we find the same ounce worth $35. Mumbo-jumbo, hoko-poko—gold is the standard, rubberoid and stretchy; but thou shalt not touch one pennyweight of such standard, for convertibility has flitted out of the window, and a gold standard without the good old convertibility may not, to some hard heads, be considered as the gold standard at all.

All of which leads to some figures of the price of gold in terms of silver, and the price of silver in terms of gold, as determined on the London and Hamburg markets from A.D. 1687 to A.D. 1872. We find that during these 185 years an ounce of gold never commanded more than 16‡ ounces of silver and never less than 14.14 ounces, and the extreme high figure occurred during the period of upheaval marked by the Napoleonic wars. The point to be observed here is that during the 185-year period the value of silver was fixed on the open markets in terms of gold, with the converse true that the value of gold was fixed in terms of silver, and that no rubbing together of silk hats and sleeves, or other fee-faw-fum, could possibly have been effective in changing the values of either of the metals.

This period of stable values in the precious metals was coincidental with the widespread use of silver as money, and with the bimetallic system in operation in almost every important Occidental country with the exception of England subsequent to 1816. In 1872 Germany, one of the important users of monetary silver, went on the gold standard along with Norway and Sweden. Their silver reserves were no longer of use and they began feeding them into the world markets. France shortly was forced off the bimetallic system, and with her went Belgium, Italy, Switzerland, Greece, and Rumania, swelling the volume of silver for sale. Again an ounce of gold would buy more than sixteen ounces of silver; but this time there was no return, for a selling flood had begun that continued for seventy years, until the day was witnessed when an ounce of gold would purchase one hundred ounces of silver—silver selling at 35¢. while gold sold at $35.

When bimetallism ceased to exist, the measure of gold value also ceased to exist, and the door was opened wide for the revaluation of gold and the devaluation of the dollar. Monetary history bristles with debasements: decreasing the weight of the precious metals in a unit, substituting the base metals in part or in whole for the gold and silver, or the issuance of inconvertible paper. All of which are schemes to create new wealth by the easy process of making shoddy money, the quantity of which has the sky for a limit. And now, with our latest curlique, who is to say that some one will not arise to juggle the token value farther so that we shall speak of gold as being worth fifty dollars, or a hundred dollars, or a thousand dollars? Which latter reflection would seem to leave but little doubt that today we really have fiat money, and any belief that we are on the gold standard is surely taking the shadow for the substance.

The function of silver as a measure of gold value, or vice versa, seems to have been entirely overlooked by students of money, past and present. This is a feature of the utmost importance to those financial interests along the Atlantic seaboard, who have numbered themselves fearful of inflation, and yet they war unremittingly against one of the two necessary elements of the soundest money the world has known. Their fight has been an old one. One of their mainstays has been that silver is a "byproduct." The word has been dinned into the ears of mankind now for decades until it has become a portent of evil. But anyone who attempts to determine the line of demarcation between "byproduct" silver and silver which is necessary to the mining of an ore, will surely find himself heavily involved in difficulties. And when a comprehensive view is taken of the existing stocks of silver with what, by the most liberal standard, can be called "byproduct" silver, it will be seen that under the most extreme circumstances, the influence of such silver must be insignificant.

So, if it is the wish of our money masters to have a dollar that has a long-range stability, they can hardly hope to realize their desire without reestablishing silver so that it may perform its ancient functions. And ideas of long-range should not be limited to a period of a century or two such as has been given consideration here, for one may find Gibbon, in his "Decline and Fall of the Roman Empire," citing figures to show that during the reign of Constantine, around 333 A.D., as well as through the reigns of his successors, a pound of gold was exchanged for fourteen pounds eight ounces of silver. That is, sixteen hundred years ago, we may observe a ratio established that falls within the limits that prevailed for so long prior to the abolition of the bimetallic system.

Charles A. Porter

Philadelphia, Pa.

Current Demands Assure Better Gold Price

The Editor:

What's Ahead for Gold and Silver Money? appearing in the March issue of *Engineering and Mining Journal*, was most timely and deserves careful study by all of us in the mining industry.

The conclusion of Mr. Just regarding gold, "Its international status as a currency base and as a settler of trade balances seems secure," is sound. No better proof for Mr. Just's conclusions could be offered than the 1943 yearly report of the Federal Reserve Bank published a few days ago.

Recent events tend to disprove Mr. Just's second conclusion regarding gold—"Its statutory price is not likely to increase or decrease for several

(*Continued on page 152*)

Native Aid Important in Finding Rhodesian Coppers

RAYMOND BROOKS, *Consulting Engineer*

Technique developed by Rhodesian Congo Border Concession, Inc., for utilizing the knowledge and services of the natives proved highly successful in bringing to attention the areas where the major discoveries were made. In this article, his second on these early explorations, Mr. Brooks also tells how British control of important properties crystallized, while the American copper groups remained indifferent.

WITH THE CHANGE of administrative responsibility that took place in 1923 when Anglo American Corporation acquired an interest in Rhodesian Congo Border Concession and in Bwana M'Kubwa, a system of "scientific" prospecting was devised, with Anglo American engineers in the saddle and with headquarters at Broken Hill.

This change in the theory of prospecting from that pursued by R.C.B.C. requires comment, though I had resigned as manager of the Congo Border company and know it only from subsequent visits. Mr. Kingston, an English engineer, was placed in charge at Broken Hill and Dr. J. Austen Bancroft, of Canada, was selected to conduct the field explorations. Within two years they had built a staff of 40 young Canadian, American, and English geologists, who were combing the bush in accordance with a systematic plan. Reconnaissance maps of areas in the Luangwa, Serenji, and Kasempa concessions were gradually produced, but no mines of consequence were found so far as published statements and subsequent activities indicate—perhaps there were none of importance in those parts of Rhodesia.

The same system was introduced to a lesser degree in the Rhodesian Congo Border Concession after 1928, but the principal copper occurrences must have been found by the earlier system of prospecting, because no important new discoveries or undertakings have been announced since.

Mufulira and Chambishi are examples of the excellent work done within the N'Kana concession by Russell Parker and Anton Gray for Rhodesia Selection Trust. This work had no relation to the "scientific" prospecting as done elsewhere by the Anglo American force.

Basic Conceptions Differ

The essential difference in these two systems of prospecting lies in the basic conception of objectives. We, in the Congo Border company, started out to find mines, wherever and however they occurred, having no preconceived ideas as to where they would be found or in what kinds of formations. The other, later geological system was conceived on a basis of searching for formations that might contain mines and then depending on the interpretation of engineers in the field and at headquarters as to whether there were any.

R.C.B.C.'s Technique

The Congo Border company, from its beginning, in May, 1923, proceeded on the theory that any outcrop, even though small, that had distinguishing characteristics or oddities like copper staining or zinc and lead colorations, had probably been seen by some native, and it became our job to get every bit of native information of this kind that could be secured in every part of the concession. To do this, we sent well-equipped parties out in pairs; one, an experienced bush prospector who could make himself understood by natives, and the other a younger man who had received some schooling as an engineer.

Of each pair, the prospector generally dealt with the natives of the area in which the party was working and handled their gang of 20 boys, while the engineer ran traverses of all trips with a prismatic compass and a wheel equipped with a bicycle cyclometer, made records of each day's activities, mapped discoveries, wrote weekly reports to headquarters and described whatever had been found, sending in samples for examination or assay, whether they could identify the mineral or not. The system worked.

Accurate maps were lacking, so the traverses these men made gradually became, by putting them together, the most authoritative information regarding location of streams, rivers, swamps, hills, and villages. Some close checks resulted. The chief difficulty arose through natives' negligence, as when the boy who shoved the measuring wheel preferred to carry it across bad places. I have known traverses of this kind, done by careful men, to close as accurately as within a quarter of a mile.

Early Obstacles

At first we were confronted by two serious obstacles: One was the native chiefs and witch doctors, who instilled in native minds the fear that they would die if they showed any white man a mineral deposit—the reason being that these leaders were afraid of losing their control if white men brought their industries and vices into the country. The other was the missionaries, who opposed us for the same

ROAD CONSTRUCTION played a vital part in the scheme followed by the Rhodesian Congo Border Company for prospecting in Northern Rhodesia, by giving quicker access to distant parts. Here one of the roads crosses the river in the Lunsemfwa area of the R.C.B.C. concession, 200 miles from N'Changa

reason. Gradually we overcame these resistances through employing more and more natives, who, for the most part, had never before had opportunities to earn money, and by getting to know the missionaries.

Incentive Pay

Money prizes were utilized to get natives to show outcrops to our prospectors. Finally I fixed the sum of £5 for disclosure of any formation in place that showed even minor evidences of copper staining or other metal content. To boys who could then earn only 12 to 18 s. a month, in addition to their food, 100 s. looked like a big stake, so, as we had hoped, they began to bring in more and more specimens.

This method was not based on theory alone, but on sound experience. We knew that natives were dependent on wild honey for most of their sugar and on wild game for meat, and that boys, and sometimes women, from every village hunted occasionally for them, in this way penetrating at some time the entire bush. It was our procedure to have our prospectors camp near villages and establish confidence by giving small presents like cigarettes and trinkets or pieces of bright calico, as well as by fair dealing when buying grain for their carriers.

Another thing we did was to give a 4-lb. hammer to a boy in each village where our men found one who appeared interested and active. This corrected a condition not realized at first, which was that the natives had no tools with which to break a rock except their light native axes and were therefore unable to get specimens from hard outcrops. Numerous discoveries were thus made in remote areas.

Road Program Helped

One purpose in starting to cut roads as soon as prospecting began was to enable the manager and engineers to get to various parts of the concession without losing too much time. The parties had to be visited periodically to keep up morale and to examine their discoveries. As operations grew, it became possible, with a touring car and a 1-ton truck, to go from headquarters at N'Changa to numerous points with sufficient carriers and camping equipment to do the additional distance to the prospector's camp in minimum time, thus sometimes saving four or five weeks of travel on foot to areas 200 and even 300 miles away. Other than shallow trenching to give some idea of the size and character of distant discoveries, nothing was done on them, and they will remain indefinitely as possible future sources of copper.

In a Copper Country

We were looking for deposits of all kinds of minerals that could be mined profitably, but soon realized that northwestern Rhodesia, like Katanga, was a copper country. We did find some gold, but it was in small alluvial deposits. We also found graphite, manganese, and iron. Cobalt occurred in some of the copper discoveries.

In the southeastern corner of the concession, 200 miles from N'Changa and 40 miles east of Kapiri Mposhi, the nearest rail point, we discovered, in 1923, a lens of chalcopyrite ore averaging 3½ percent copper, in granite. We called the area Lunsemfwa, from the nearby river on the west side of which a copper outcrop called Mtuga had been found by a prospector some years before and developed in a small way. The Lunsemfwa lens, a mile distant, was found by two of our men, Fraser and Foster. The only evidence of copper mineralization was a rusty area of partly decomposed granite with a minor amount of malachite staining. We trenched and then sank two small 75-ft. shafts and ran a crosscut to connect them, disclosing a lens 40 ft. wide averaging 3½ percent cop-

GEOPHYSICAL PROSPECTING was employed by R.C.B.C. with good results in various areas after the major discoveries in them had been made. In this view a party is seen making an electrical survey at N'Changa. Similarly at Lunsemfwa, after a chalcopyrite lens had been found by trenching and sinking, a survey with the equipotential method disclosed six other lenses

per. A contract was let in London to A. D. Broughton-Edge, a geologist who came out from England with geophysical equipment to study the area. The equipotential method was used, which proved accurate and fast, disclosing six other lenses of similar ore that had no surface manifestation, the largest of which was 70 ft. wide and 800 ft. long. Widths and lengths of several lenses were then confirmed with shafts and crosscuts, and an extensive program of development was started on recommendation of the Anglo American company in May 1926. Just as it got well under way, word came from London to cancel it and confine activities to N'Changa development and general prospecting.

Aerial Survey Initiated

While the Lunsemfwa operations were getting started the London office contracted with the Air Craft Operating Co. to make an aerial survey of the concession and sent full detailed instructions to me in Africa to prepare base flying fields at N'Changa and Lunsemfwa and one field in the west, with emergency landing places at 20-mile intervals. A hangar and an office were to be built at once at N'Changa. Two planes and crews were on the way out when we first heard of the plan in Rhodesia.

This presented a serious problem, because near-famine conditions existed that year and native labor had to be found and fed. The government agreed to help a plan for making landing fields by recruiting boys at points inside and outside of the concession on a prearranged schedule, and the company agreed to transport food to these points, furnish supervision, and pay the boys. The program was put into operation in Africa before our estimates of the cost reached London. On receipt of this information, which had not previously been requested, the Board wisely decided to restrict the first aerial mapping to the eastern portion of the concession.

I give these details to illustrate how important it is in exploration work in far places to plan major activities well in advance. It is such unexpected demands that often put unnecessary burdens on a manager and cause disappointing financial statements at the year end.

American Indifference

None of the three major American copper groups sent engineers to report on what was being done in Northern Rhodesia. They showed no curiosity or interest whatever, even though one of them had been invited to subscribe to the exploration undertaking in 1924 and had been informally and accurately advised about progress and expectations as developments proceeded. This has long remained one of the enigmas of the copper mining business.

In 1926 N'Changa was floated in London as a separate company, and development was financed independently. Some, at least, of the Congo Border directors had visualized the advantages of subsidiary flotations of individual discoveries, because, in May, 1926, just 36 months after the first prospecting parties were sent out into a roadless, mapless, and practically unknown country, we received the most unusual cable of that entire period. It closed with the classical phrase: "We must have several developed mines by the end of the year."

British Strengthen Control

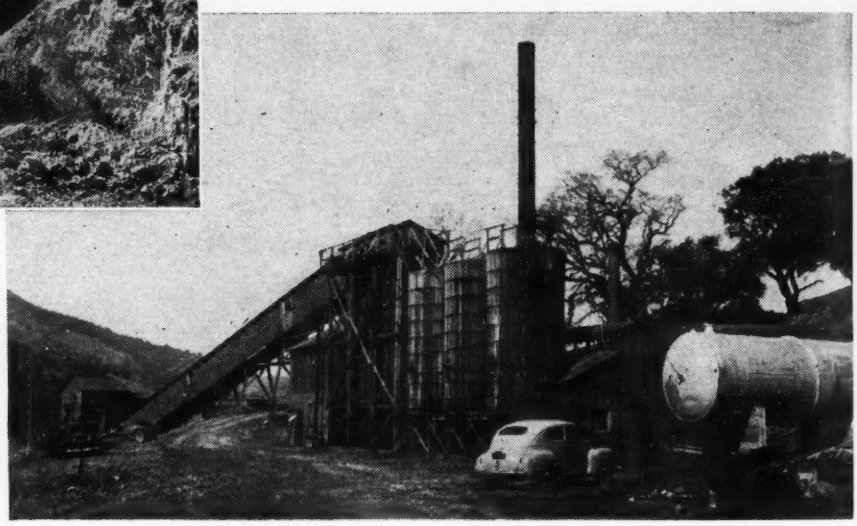
One prominent American mining company did send representatives to London in 1928 to try to secure control of the N'Changa mine, but it was too late. The effect of that approach was to crystallize British control of N'Changa through the cooperation of some of the strongest groups in England: Anglo-American Corporation, Johannesburg Consolidated Investment Co., the powerful Chester Beatty and Edmund Davis interests, the chartered company, Minerals Separation, and Rio Tinto.

A prominent American investment trust had just previously acquired large holdings in the Congo Border and N'Changa companies, but was again too late to profit by it. This group secured a place on the R.C.B.C. board but was overridden by the London interests when the Congo Border company was merged with Bwana M'Kubwa and N'Kana to form the Rhokana Corporation. After that, Rhokana virtually discontinued the development of N'Changa and active prospecting in the Congo Border Concession, throwing all its effort and weight into the rapid development and equipping of the N'Kana mine, and its interest in the Mufulira.

There were good reasons for confining the major effort to N'Kana, Roan, and Mufulira at that time, because they were all showing up large tonnages of sulphide ore, whereas N'Changa, further from the railway, had two problems to solve: water, and mixed sulphide-oxide ore. With the present great need for copper for the war, N'Changa, the first R.C.B.C. discovery, is being equipped for larger production and will, many believe, be the biggest mine of them all.

Further details of these early explorations, including the manner of organizing the prospecting and the difficulties met and overcome, will be discussed by Mr. Brooks in a third and concluding article next month.

MODERN GOULD TREATMENT PLANT operating since January, 1944, at Laco Mining Co.'s Guadalupe quicksilver mine, one of California's oldest producers. From the crusher building at left, ore is conveyed up to a bin feeding a rotary furnace set up in a building behind the 24-ft. pipe condensers and the three tank condensers. Mercury, volatilized in the furnace, collects in the condensers; remaining gas exhausts through stack



THE KELLY CUT supplies new access to the Guadalupe orebody. Here, in an 80-ft. adit and three exploration drifts, about one-third of the plant feed of 80 tons is mined daily. Jackhammers are used for all drilling, and a portable compressor supplies air for the drills and a mechanical loader

Guadalupe Mercury Mine Has New Treatment Plant

JOHN B. HUTTL, *Associate Editor*

DURING A RECENT VISIT to the New Almaden quicksilver mining district, in Santa Clara County, California, I had the privilege of visiting the Guadalupe mine, a property whose output of 110,000 flasks of mercury during the ninety-odd years of its life places it fifth in the ranks of California's quicksilver producers. Laco Mining Co., which has worked the mine for the past ten years under a lease from the Gregory estate, now takes about 80 tons of ore daily from the property for treatment in a modern Gould furnace plant completed in January, 1944.

Situated on the west slope of the New Almaden ridge about 10 miles south of San Jose, the property covers about 2,000 acres, and in its geology it is identical with the adjoining New Almaden mine. (See *E.&M.J.*, March, 1943, p. 59.) Footwall of the orebodies, which lie in Jurassic sandstones and shales, is a serpentine; the hanging wall is a clay gouge, under which the mineralizing solutions appear to have been trapped.

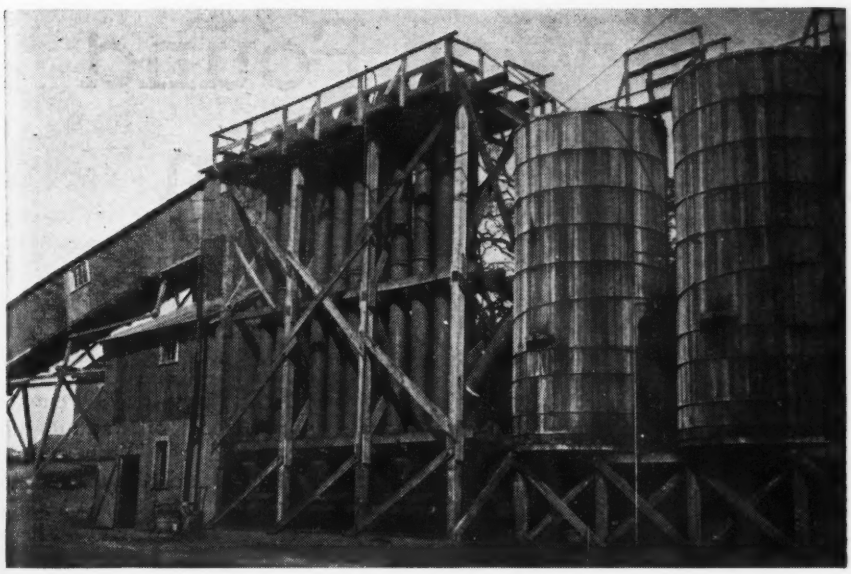
Development Under Way

The mine is opened by a 700-ft., two-compartment shaft, inclined at 47 deg., from which several levels, with lateral workings, have been driven. The mine is flooded up to the 465-ft. mark in the shaft, and only the two upper levels are open for development, which is now in progress on the uppermost. The water level is maintained with a 5-stage, 4-in. Nash turbine pump, and it is planned to bring the two upper levels into production shortly.

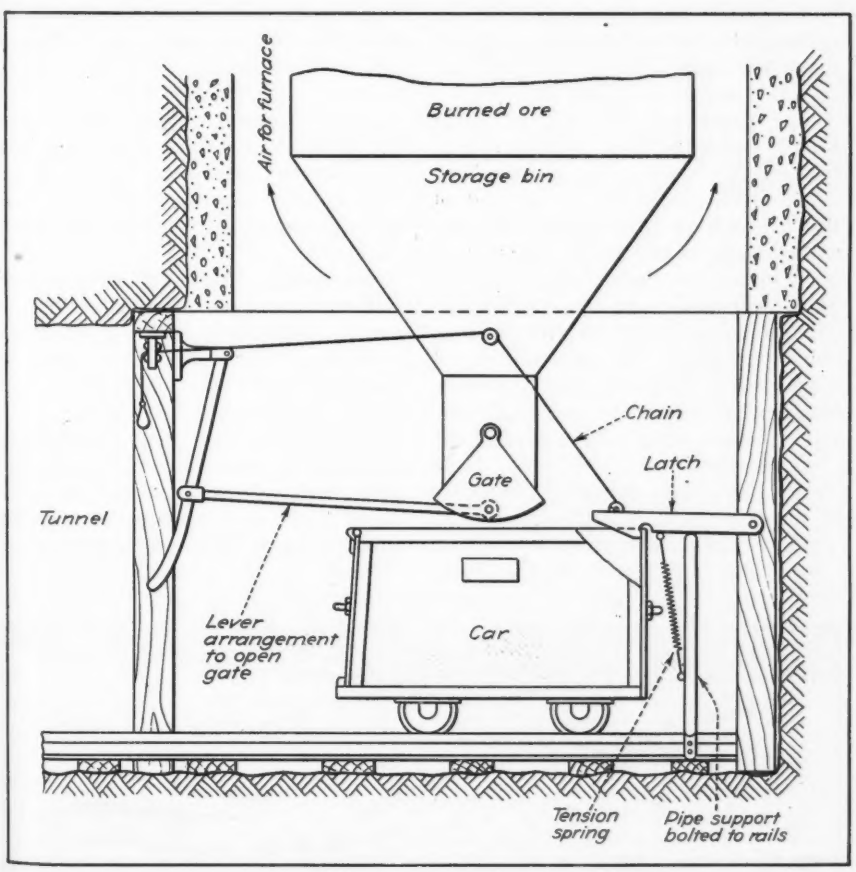
Equipment available at the incline shaft consists of a wooden headframe and a double-drum hoist powered by a 95-hp. gasoline engine. The hoist will be electrified as soon as conditions permit. Near the hoist house is the shop for servicing drills and trucks.

About two-thirds of the present plant feed comes from an old dump near the mine shaft, and the remainder comes from the so-called Kelly Cut, a new opening into a part of the mine recently diamond-drilled by the U.S.B.M. The equipment used in the crushing and the treatment plant is shown in the accompanying flowsheet.

Officials of the Laco Mining Co. include: H. N. Mason, president; George Kirk, vice president; Howard Meade, treasurer; and L. M. Bennett. P. D. Burtt, secretary, is in charge of mining and of plant operation.

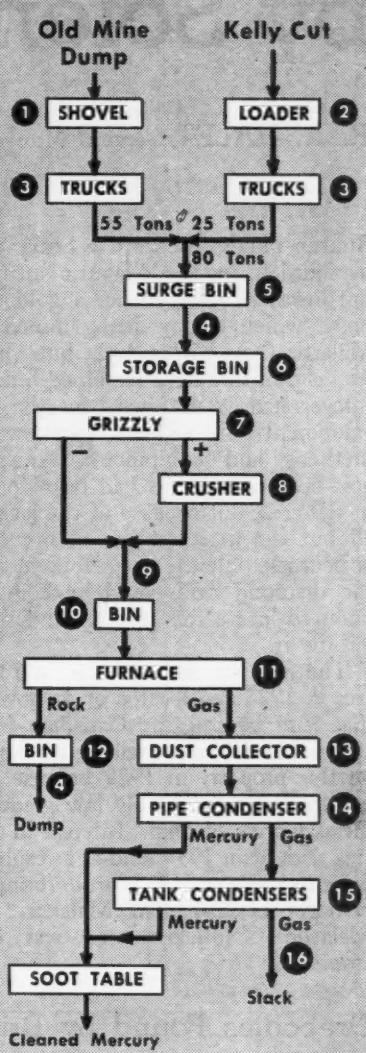


COLLECTED MERCURY, caught in earthenware jars placed under these pipe condensers, is removed daily to a long table containing soot sprinkled with lime. Raking contents of jars on this soot table coalesces mercury particles to liquid form, which drains off at corner of table. Residue is returned to the furnace. Before entering these condensers, furnace gases pass through a dust collector, the accumulated dust from which is washed into a nearby settling tank



INGENIOUS CAR SPOTTER in use under burned rock bin at the Guadalupe mine. Grade of the track is in favor of the load. Made of steel, the bin holds barren rock discharged from the rotary furnace at 400 deg. F., and its sides are hot. Note that air for the furnace is led up around the bin to be pre-heated before entering the furnace intake

GUADALUPE QUICKSILVER MINE



LEGEND

1. Link-Belt shovel, ⅜-cu. yd.
2. Gardner-Denver loader
3. Chevrolet trucks, 2½-cu. yd.
4. Joshua Hendy end-dump cars
5. Concrete surge bin, 160-ton
6. Wooden storage bin, 70-ton
7. Steel grizzly, 2-in. opening
8. Joshua Hendy jaw crusher, 10x20-in.
9. Belt conveyor, 18-in., 154 ft. long
10. Hopper-bottom steel bin, 60-ton
11. Rotary furnace, 4x64 ft., 1 r.p.m.: oil fired, slope of ¾ in. per ft. Temp. at firing zone, 1,000-1,100 deg. F.; at discharge, 400 deg. F.
12. Hopper-bottom steel bin
13. Sirocco dust collector
14. Spun cast-iron pipes, each 24 ft. high, 16 in. diameter, total length, 720 ft.
15. Three redwood tanks, 10x20 ft.
16. One Sirocco fan for draft, driven by Stirling variable-speed motor unit.

Malartic Mine Was Found by Scientific Exploration

R. A. HALET, *General Manager, Malartic Gold Fields, Ltd., Halet, Quebec, Canada*

BURIED DEEPLY beneath a heavy clay overburden in the Malartic area of northwestern Quebec lies a gold orebody, which is now being mined by Malartic Gold Fields, Ltd., but which would probably have remained hidden forever had it not been for the development of modern prospecting methods and equipment. Angular, gold-bearing boulders had been found in the area, but because of the lack of all but the most meager of outcrops of bedrock, only the magnetometer and the diamond drill could be counted upon to locate the orebody and then outline it.

The first prospectors came into this area in 1925 and located on a showing that later became the Canadian Malartic gold mine, although work stopped on this property in 1929 because the ore seemed unprofitably low grade at the old price of gold. Interest in the area revived in 1934, and as a result of the enterprise of J. P. Norrie, formerly manager of Canadian Malartic, the Malartic Goldfields mine was discovered.

Orebodies Found by Drills

Mr. Norrie and his associates staked several groups of claims in the area east of the Canadian Malartic mine along the strike of the formation. Prospecting these claims, which later became East Malartic Mines, Ltd., and Malartic Gold Fields, Ltd., was extremely difficult because of the heavy clay overburden, but a magnetometer survey was able to establish the presence of the ore-bearing formation within the claims of these two companies. It was recognized that actual search for ore would have to be done by diamond drilling, and this work was begun in 1936, following the purchase of part of the capital stock of the company by Nesbitt Thomson & Co., of Montreal.

The geological conception that had been the basis of the original location was confirmed by a few preliminary drill holes. Then came the more difficult task of locating orebodies. At first, several thousand feet of drill holes were put down along the contact in positions analogous to those which had yielded ore on the East Malartic property, but this procedure soon gave way to a systematic exploration of the entire formation in order to give a complete cross-section. Holes were to be put down in lines across the formation at intervals of 1,000 ft. along the strike.

This enterprise was fortunate from the start, and little cross-section drilling was necessary. The fourth hole of the first cross-section cut good orebodies, and by that time 55,000 ft. of hole had been drilled. Several thousand feet of additional drilling was required before underground development could be contemplated, and the whole search for ore, though successful, cost about $200,000.

The experience of Malartic Gold Fields indicates the problems confronting the prospector in the Canadian Shield. Less than 5 percent of the bedrock in this region outcrops, and though many good mines have been found, no doubt there are many more well hidden by the overburden. Modern prospecting in this sort of country requires the expenditure of large sums in order to investigate areas that appear to be good geological bets, but show no other evidence of value.

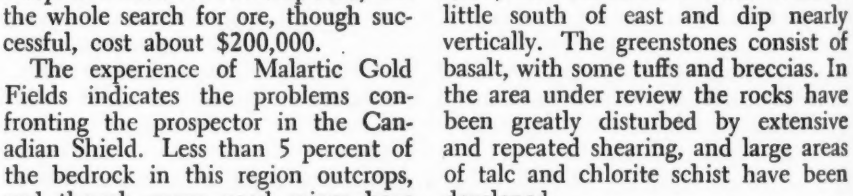
Development of Malartic Gold Fields was rapid, following discovery of the orebodies. A shaft was sunk in 1939 to 450 ft. and three levels were established. By August, 1939, enough ore was developed to warrant mill construction, and a 350-ton cyanide plant was in operation by Dec. 16, 1939, ten months after the first round was taken out of the shaft. Mill capacity has since been increased to 750 tons daily.

To the end of 1942, the mine has produced over $5,000,000 in gold from ore assaying slightly over 0.20 oz. gold per ton.

Geology

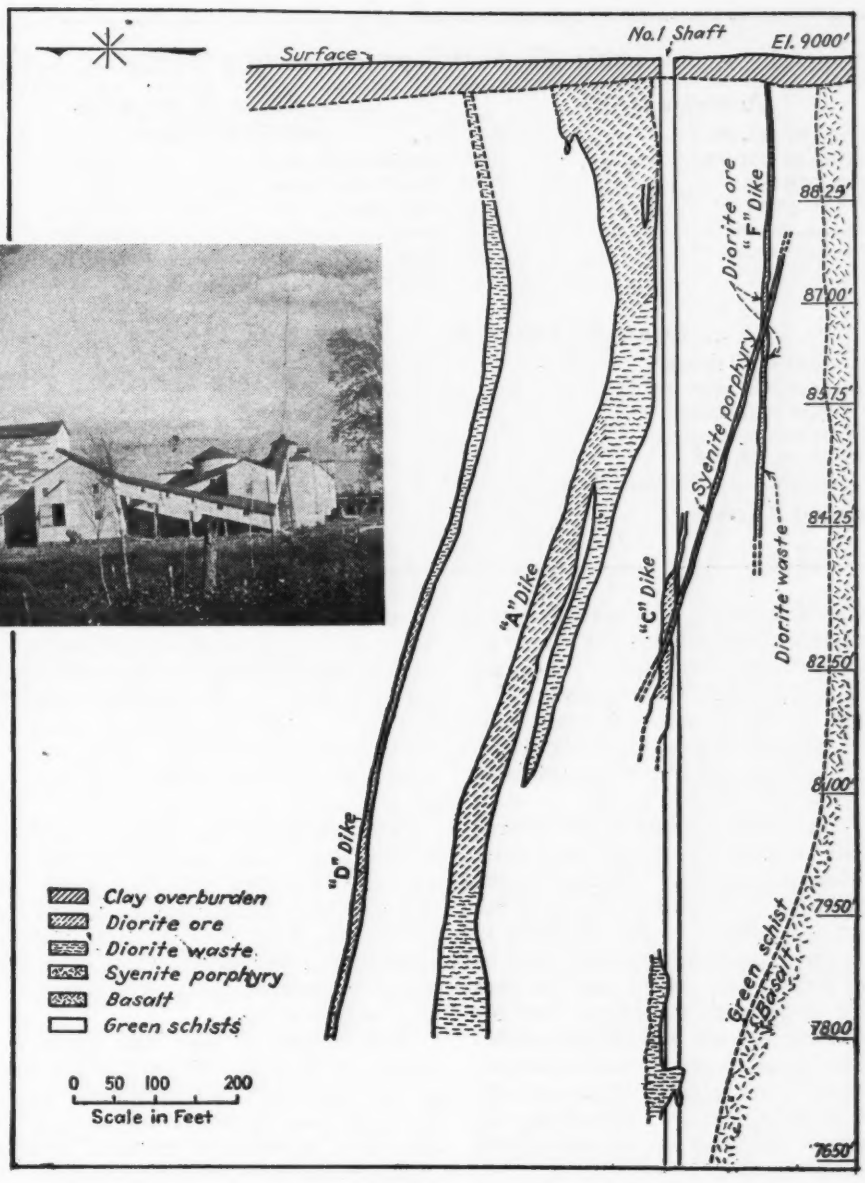
The ore-bearing formation is a band of Pre-Cambrian greenstones, 3,000 ft. thick, within a series of sedimentary rocks, the formations of which strike a little south of east and dip nearly vertically. The greenstones consist of basalt, with some tuffs and breccias. In the area under review the rocks have been greatly disturbed by extensive and repeated shearing, and large areas of talc and chlorite schist have been developed.

Numerous dikes of diorite and feldspar porphyry intrude the greenstones, particularly in the more schistose areas. These dikes have not been sheared, but in places they have been greatly fractured, and orebodies occur in these fractured and mineralized zones. The most favorable areas appear to be where a number of dikes occur in the acute angle formed by the intersection of two converging shear



GEOLOGIC PLAN of Malartic Gold Fields mine. Present production comes from No. 1 shaft, but an orebody apparently three or four times as large has been found at Shaft No. 2. It awaits postwar development, when men and machinery again become available

GEOLOGIC SECTION through Shaft No. 1 shows diorite and syenite dikes in which Malartic ore is found. Note heavy overburden



SURFACE PLANT of Malartic Gold Fields, Ltd., new Quebec venture made possible solely by modern prospecting methods

zones. Two such areas have been discovered at Malartic Gold Fields.

Diorite dikes are much more favorable hosts for ore than porphyry. Even where the two rocks occur together, gold content may be as high as 1 oz. per ton in the diorite, yet less than 0.10 oz. per ton in the porphyry.

Ore Mineralization

Individual dikes may be much as 1,000 ft. long. They are lenticular along the strike, but, fortunately for the miner, they are not so lenticular along the dip. The dikes vary in width up to 100 ft., but little ore has been found in portions more than 40 ft. wide. In general the narrower and more lenticular portions yield the best ore, because fracturing has been more complete under these conditions.

Mineralization consists of closely spaced parallel quartz veinlets crossing the dike from wall to wall. Two sets of veinlets are common, one which we call the flat veins, striking nearly parallel to the dike and dipping at a much lower angle than the dike, and another set, which we call cross veins, striking at right angles to the dike and dipping vertically.

The veinlets are from a fraction of an inch to a foot thick, and the wall rock on either side of the veinlet is heavily mineralized with pyrite, and a little arsenopyrite, chalcopyrite, and galena. Very little sulphide mineral occurs in the quartz. Visible gold is very rare, and most of it appears to be intimately associated with the pyrite, which forms as much as 15 percent of the total volume of the ore.

Mining

The orebodies occur in two relatively compact areas, and are developed from two shafts 3,000 ft. apart. The No. 1, or East, shaft is the older. It is a three-compartment opening, 1,400 ft. deep, with nine levels. A steel headframe 120 ft. high has been erected over this shaft, and it is served by a 72-in. diameter by 60-in. face double-drum Nordberg hoist operating at a rope speed of 700 ft. a minute. Two skip-cage combinations are used, the cages hanging below the 3-ton skips.

The No. 2, or West, shaft is a five-compartment opening 500 ft. deep,

Table I. Cost of Cut-and-Fill Stoping

Average at Malartic Gold Fields, Ltd., for the first 9 months of 1943 in dollars per ton of ore mined

	Labor	Supplies	Total
Drilling and blasting	$0.287	$0.115	$0.402
Mucking	0.388	0.017	0.406
Timbering	0.157	0.270	0.427
Filling	0.151	0.246	0.396
Tramming to ore pass	0.181	0.000	0.181
Total	$1.164	$0.648	$1.812

Table II. Metallurgical Data, Malartic Gold Fields, Ltd.

Analysis of Ore

Gold, oz. per ton	0.30
Silver, oz. per ton	0.07
Iron, percent	9.66
Sulphur, percent	4.19
Arsenic, percent	0.15
Copper, percent	0.01
Lead	Tr

Consumption of Supplies per Ton of Ore

Forged balls, 4-in.	0.88 lb.
Cast balls, 1½-in.	1.29 lb.
Cyanide	0.69 lb.
Lime	2.25 lb.
Zinc dust	0.07 lb.
Electric power	27.6 kw. hr.

Milling Cost, Cents per Ton

Sorting	3.8
Crushing	8.4
Grinding	24.3
Cyanidation	26.8
Miscellaneous	15.0
Total	78.3

Operating Data, 1943

Average daily tonnage	654
*Average mill head, per ton	$7.14
Average mill tailing	$0.366
Soluble loss in tailing	$0.015
Recovery, percent	94.81
Tons solution precipitated daily	1,542

*Gold at $35 per oz.

Screen Analysis of Tailing

Size Fraction	Weight, Percent	Gold, Oz. per Ton
+150	2.92	0.0056
−150, +200	10.54	0.0115
−200, +325	24.54	0.0130
−325	62.00	0.0050
Total	100.00	0.0076

with three levels. This shaft is 19x12-ft. outside the timbers and has compartments for two skips, a large cage, a counterbalance, and a manway. This shaft is not equipped for large-scale mining, and during the current war only a small amount of development work is being done.

The major orebodies are several hundred feet long and have great vertical continuity. Mining widths vary from 5 to 40 ft. The principal mining problem is the weakness of the rocks inclosing the orebodies. The ore itself is very strong, and the back of a stope needs no support, but the walls are soft talc and chlorite schists. If too great an area of wall rock is exposed, it immediately begins to scale off in slabs, thereby undermining the back of the stope and causing a great deal of trouble.

Mining by Cut-and-Fill

The flat-back cut-and-fill method has proved satisfactory. Continuous stopes several hundred feet long can be carried as long as not too great a vertical span remains open at any one time. Successive horizontal cuts 8 ft. high are broken so that the maximum opening at any time is 16 ft. If the walls are particularly weak, the backfill can be carried close to the mining face. If there is any sign of weakness in the back, temporary cribs can be installed on the fill so as to support the back.

Ore is broken by horizontal holes onto a plank floor laid on the fill. It is then mucked by hand into cribbed chutes carried up through the fill at 25-ft. centers. Fragmentation of the ore is poor, and though no fines are produced by blasting, many large pieces are broken. This has necessitated the placing of grizzly rails, spaced 12 in. apart, on top of all the mill holes in a stope, and considerable drilling and blasting of large pieces has to be done by the muckers during the shift. Some experiments using more holes and stronger explosives have given a certain measure of success.

Mechanical mucking has been tried in one stope with considerable success. Double-drum electric scrapers of 15 hp. were used to remove ore and spread fill. The chief difficulty was again poor fragmentation, which necessitated frequent stoppages to drill and blast large pieces.

The backfill is sand and gravel, hauled to the mine by truck from a pit one mile away. It is distributed in the mine from a central fill-pass system, from which it is trammed and dumped into raises feeding each stope. The fill is distributed in the stope by small cars operating on light, movable track.

All drilling is done with 3½-in. drifters in stopes and drifts. Detachable bits are used exclusively. Eimco 21 loaders are used wherever possible in drifts and stope preparation work, because this machine seems admirably suited to handling coarse material.

The five 1½-ton storage-battery locomotives that are used for haulage will haul up to six 2-ton side-dump cars each. The track is 24-in. gage, using 20- and 30-lb. rail.

All direct production work is on contract. Prices are fixed by the engineering department. The average performance in flat-back cut-and-fill stopes is about 6.5 tons per man-shift. Approximately 9 bd.ft. of timber, 0.70 lb. of powder and ¼ cu.yd. of back fill are consumed per ton mined. Table I shows the average cost of cut-and-fill stoping during the first nine months of 1943.

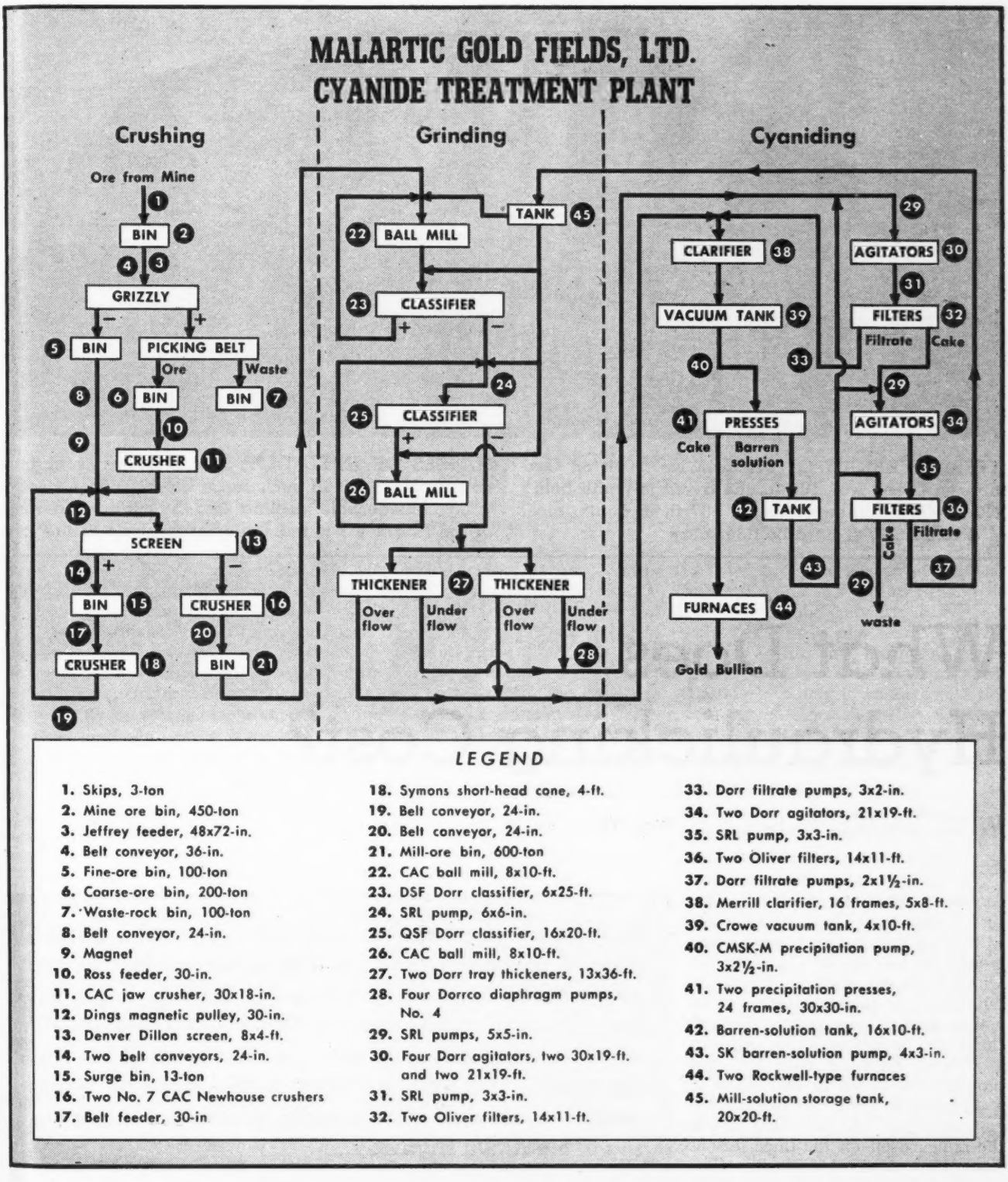
Metallurgy

A chemical analysis of the ore is included in Table II, which presents metallurgical data. The principal metallic mineral is pyrite, which occurs in quantity unusual for a gold ore, and most of the gold is intimately associated with it. Metallurgical tests showed that 95 percent of the gold could be extracted by cyanidation without unduly fine grinding or excessive fouling of the solutions. The present tailing assays 0.0076 oz. per ton. Assays of the various fractions of the tailing are shown in Table II. Because considerable expansion of operations is anticipated after the war, a thorough metallurgical study is now being made to see if present practice can be improved.

The accompanying flowsheet shows the method of treatment of the ore and the equipment used. The picking belt indicated on the flowsheet is not used at present, because it is regarded as superfluous while the tonnage is as reduced as it is now.

Briefly, the mill flowsheet features two-stage grinding, thickening, agitation in two stages, filtration, clarification, and precipitation. In the primary ball mill, 4-in. forged-steel balls and Ni-Hard (nickel-alloy) liners are used; in the secondary mill, 1¼-in. cast-iron balls and pocket liners are used. Consumption of 4-in. balls is about 1 lb. per ton, and of 1¼-in. balls, 1½ lb.

In the treatment plant, the overflow of the 16x20-ft. Dorr classifier, at a specific gravity of 1.070, is split into two equal portions and fed to the tray thickeners. Three overflow boxes are provided for each thickener, and the overflow goes by gravity to the clarifier. The pulp is thickened to about 1.60 sp.g. Lime content is kept at about 0.9 lb. per ton of solution and the



LEGEND

1. Skips, 3-ton
2. Mine ore bin, 450-ton
3. Jeffrey feeder, 48x72-in.
4. Belt conveyor, 36-in.
5. Fine-ore bin, 100-ton
6. Coarse-ore bin, 200-ton
7. Waste-rock bin, 100-ton
8. Belt conveyor, 24-in.
9. Magnet
10. Ross feeder, 30-in.
11. CAC jaw crusher, 30x18-in.
12. Dings magnetic pulley, 30-in.
13. Denver Dillon screen, 8x4-ft.
14. Two belt conveyors, 24-in.
15. Surge bin, 13-ton
16. Two No. 7 CAC Newhouse crushers
17. Belt feeder, 30-in
18. Symons short-head cone, 4-ft.
19. Belt conveyor, 24-in.
20. Belt conveyor, 24-in.
21. Mill-ore bin, 600-ton
22. CAC ball mill, 8x10-ft.
23. DSF Dorr classifier, 6x25-ft.
24. SRL pump, 6x6-in.
25. QSF Dorr classifier, 16x20-ft.
26. CAC ball mill, 8x10-ft.
27. Two Dorr tray thickeners, 13x36-ft.
28. Four Dorrco diaphragm pumps, No. 4
29. SRL pumps, 5x5-in.
30. Four Dorr agitators, two 30x19-ft. and two 21x19-ft.
31. SRL pump, 3x3-in.
32. Two Oliver filters, 14x11-ft.
33. Dorr filtrate pumps, 3x2-in.
34. Two Dorr agitators, 21x19-ft.
35. SRL pump, 3x3-in.
36. Two Oliver filters, 14x11-ft.
37. Dorr filtrate pumps, 2x1½-in.
38. Merrill clarifier, 16 frames, 5x8-ft.
39. Crowe vacuum tank, 4x10-ft.
40. CMSK-M precipitation pump, 3x2½-in.
41. Two precipitation presses, 24 frames, 30x30-in.
42. Barren-solution tank, 16x10-ft.
43. SK barren-solution pump, 4x3-in.
44. Two Rockwell-type furnaces
45. Mill-solution storage tank, 20x20-ft.

KCN strength at 0.55 lb. in the thickeners.

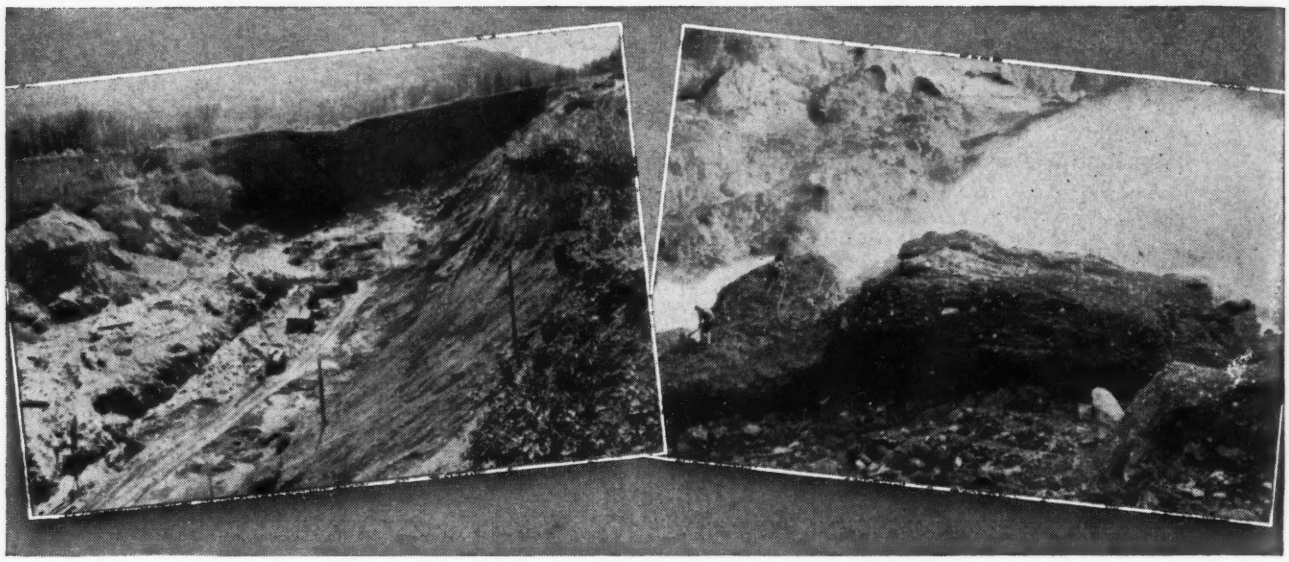
In the agitators, the pulp is diluted with barren solution to about 1.50 sp.gr., which has been found to give a better extraction. Total time of agitation is about 30 hours. In the first 8 hours, the lime drop is rapid from 0.9 to 0.2 lb. per ton, and lime is added to maintain the required strength.

Filtrate from the intermediate filtration goes to the clarifier, and the filter cake is repulped with barren solution and fed to additional agitators. The time of contact for this second stage is about 8 hours. In the final filtration the wash used is made up of half barren solution and half water. The filtrate is returned to storage for use as grinding solution; the cake is repulped with water and sent to waste.

The Butters clarifier is an 8x9-ft. steel tank carrying 16 8x5-ft. canvas bags. The clarifying leaves are connected to a 5-in. manifold by 1-in. pipes and valves. Clarified solution goes to a Merrill-Crowe precipitation system. About 15 lb. of lead acetate is added daily to the zinc cone.

Solution tonnage is measured with a stop watch by timing a 3½-in. drop of incoming solution in the clarifier three times each shift.

The presses are cleaned up three times a month, and the precipitate is melted in Rockwell-type furnaces.



AVERAGE HEIGHT OF FACE in No. 1 pit on Germansen Creek was 165 ft., the average width being 300 ft. Overburden averaged 137 ft. in depth, most of it consisting of hard boulder clay

MASSES OF HARD CLAY which caved from the face in No. 1 pit in such large dimensions necessitated considerable drilling and blasting. The size of the fragments is indicated by the men at the left

What Does Hydraulicking Cost?

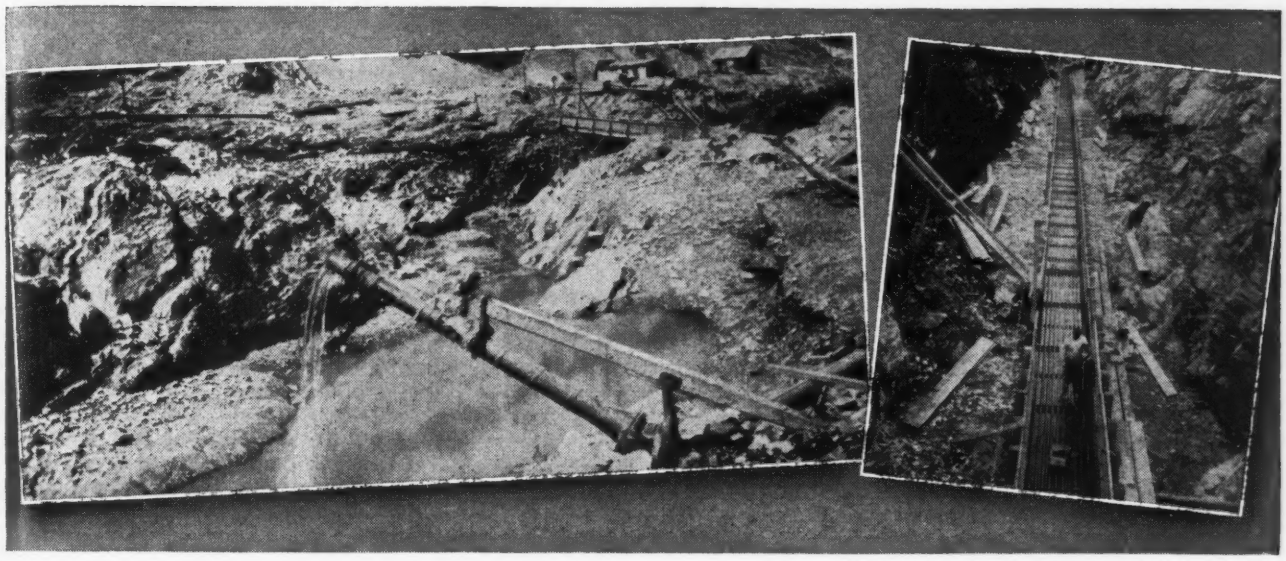
W. H. EASSIE, *Caulfield P. O., West Vancouver, B. C.*

Cost figures are always welcome, especially for the type of operation that the handbooks seem to have overlooked. The data given by Mr. Essie in this case-study from a remote area in British Columbia should be of value to anyone contemplating work of the sort described. The northern part of the Province is expected to develop more rapidly because of the opening of the Alcan Highway.

ADVERSE CONDITIONS confronted Venture Exploration (East Africa) Co., Ltd., when it undertook to work placer ground on Germansen Creek, in the Omineca district, northern British Columbia, by hydraulic mining. These will be detailed subsequently. Despite them, the operation, which began in 1937 and continued until the gold property was forced to shut down in 1942 owing to war conditions, yielded costs averaging 9.8c. per cubic yard in the principal pit for the three seasons from 1939 to 1941 inclusive. The mine is approximately 175 miles north of the railway at Vanderhoof, B. C.

Water was brought from a point on Germansen Creek 10 miles away through flume and ditches with a maximum capacity of 200 cu.ft. per second. During the low-water period on the creek additional water was available from Germansen Lake, where a storage dam impounded, after the lake level had been raised 5 ft., some 25,000 acre-feet of water. The first 2½ miles of the ditch system consisted of a flume following the canyon of Germansen Creek, where the banks were extremely high and steep and soil conditions adverse, as the top soil consisted largely of light material resting on steeply inclined rock and clay. The natural drainage was practically all subsurface, and any additional moisture, as from heavy rain, rapidly melting snow, or flume leakage, rendered the ground extremely unstable. This section was also vulnerable to rock- and snow-slides, all of which affected the cost of ditch maintenance.

The ground mined was situated in three separate interglacial channels, one, where elevating was necessary, at a considerably lower level than the others. In addition, several terraces of the modern creek were also worked, in one instance by draglining below creek level. On the whole, mining



ONE OF THE MONITORS in No. 1 pit. An adverse factor in this pit was the extreme roughness of the bedrock, which caused loss of time in cleaning it. Others were the depth of overburden, the difficulty in caving the clay from the rim, and the amount of drilling

NO. 1 PIT SLUICE, which ran through a continuous rock cut, was paved throughout with rail riffles laid longitudinally

conditions were adverse, as said at the outset, more particularly as the grade of the old channels was slight, never exceeding 1 percent, and in their case deep and expensive rock cuts were necessary at each sluice setting to tap the maximum quantity of ground.

With the exception of a comparatively small amount of Keystone drilling, undertaken to determine the course of the channels, prospecting was done hydraulically. In all, six pits were opened, but only one pit was worked continuously during each mining season throughout the operation.

This pit (No. 1) was in a channel having an average width of 300 ft. and confined within high rock rims. The depth of overburden averaged 137 ft. Values were entirely confined to bedrock and the superimposed pay gravel, which varied from a few feet to 20 ft. in thickness. The bulk of the overburden consisted of hard boulder clay, with an average thickness of 80 ft., which usually caved in exceptionally large masses requiring much drilling and blasting. The bedrock was extremely rough and broken, with deep potholes and gullies. The pay gravel was coarse, and boulders were numerous not only in the pay gravel but throughout the boulder clay and ground adjacent to the surface.

The sluice, which eventually attained a length of 1,300 ft., was 5½ ft. wide, with a grade of 3.5 percent, and was paved throughout with rail riffles laid longitudinally. The sluice was extended through a continuous rock cut with a maximum initial depth of 50 ft. Though the dump on the whole was good, a monitor with a 6-in. nozzle was eventually found necessary at the tail of sluice to clear away accumulated boulders and rock from the cut. Piping water at the face was from two monitors with 8-in. and 9-in. nozzles respectively, operating under a 220-ft. head. Air for the drills was supplied by a diesel compressor.

Disadvantageous factors in this pit were the depth and nature of the overburden, the difficulty of caving the tenacious boulder clay which adhered strongly to the rims, the necessity for an excessive amount of drilling and blasting, not only in connection with breaking up large masses of clay and

Table I. Hydraulicking Costs (Accumulative) Pit 1. Seasons 1939, 1940, 1941

	1939	1940	1941	Average, Cents per Cu. Yd.
	Per Cubic Yard in Cents			
Hand-cleaning bedrock	....	0.14	0.15	0.10
Clean-up expense	0.15	0.09	0.13	0.12
Drilling and blasting	0.68	0.75	1.24	0.84
Lighting expense	0.01	0.01	0.03	0.10
Nozzlemen	0.55	0.52	0.60	0.55
Pipe lines	0.09	0.32	0.34	0.25
Pre-season expense	0.16	0.03	0.05	0.08
Sluice building	0.24	0.24	0.25	0.25
Sluice tending	0.20	0.22	0.26	0.22
Shutdown expense	0.01	....	0.02	0.01
Truck and tractor operating	0.07	....	....	0.02
Miscellaneous	0.01	0.01	0.23	0.07
Prospecting	....	....	0.11	0.03
Total pit costs	2.17	2.33	3.41	2.55
Auxiliary operations	1.84	1.46	2.04	1.73
Overhead and general expense	1.96	1.81	2.48	2.02
Total cash costs	5.97	5.60	7.93*	6.30
Depreciation	1.79	1.91	3.25	2.20
Depletion	1.06	1.21	1.77	1.30
Total costs	8.82	8.72	12.95	9.80

"Auxiliary operations," above, included machinery, equipment, flume, ditch pipe line, transmission line, telephone, and road maintenance, truck and tractor operating, camp lighting, flume and ditch patrol, blacksmithing, freighting, etc. "Overhead and General expense" included engineering salaries, office, legal, radio, lease, and warehouse expense, insurance, transportation, and all other overhead charges.

*Abnormal in 1941 due to extra ditch trouble.

boulders, but in extending the deep rock cut, and the extreme roughness of bedrock, which caused considerable loss of time in cleaning it hydraulically for perhaps too-frequent clean-ups. Contributing also to higher costs was loss of time due to an exceptional amount of flume trouble, the shortness of the mining season, and the high cost of trucking supplies and material over 175 miles of inferior roadway.

In connection with the costs for this pit, given in Table I, it may be mentioned that careful stadia surveys were made monthly, and the yardage removed was estimated from them. In inaccessible places stadia rods were lowered over the vertical face to obtain the height of caved ground. Although under such dangerous faces, prohibitive of too close approach, any yardage figures from individual surveys must necessarily be approximate, in this instance, inasmuch as the yardage was estimated from the same cross-sections monthly, any under- or over-estimation for any particular month would be automatically corrected by subsequent surveys and the final error confined to the ultimate one. In all, during the three mining seasons shown, more than 2,000,000 cu-yd. of ground was removed, so that the final average costs given, which are the result of careful accounting and collecting of data, must be as close an approximation as possible.

Average yardage washed per season was 730,600 cu.yd., and the estimated average duty of water used in piping, including water expended in mucking out rock cuts, blowing-in and cleaning ground sluices and cleaning bedrock, varied in different seasons from 30 to 40 cu-yd. of water to 1 cu-yd. of material sluiced. The ground from the rims outside of a vertical column over cleaned bedrock averaged 42.5 percent of the total yardage piped, giving a total average of 79.4 cu.yd. of material removed for every square yard of bedrock cleaned. Actual piping time totaled an average of 125 days per mining season.

Table II. Hydraulicking Costs Pit No. 6. Season 1940

(Pit cost only, exclusive of overhead and auxiliary operations)

	Cost per Cu. Yd., Cents
Clean-up expense	0.02
Drilling and blasting	0.41
Lighting	0.02
Nozzlemen	0.79
Pipe lines	0.51
Pre-season expense	0.25
Sluice tending	0.65
Sluice building	0.20
Cleaning bedrock	0.04
Miscellaneous	0.07
Total pit costs	2.96

In Table II costs are given for another type of pit where the overburden averaged 75 ft. but was fairly easily washed, no boulder clay being present. This pit was only a prospect and was worked with one No. 4 monitor with a 6-in. nozzle and one No. 2 monitor with a 4-in. nozzle. As it was necessary to stack tailings, an additional No. 2 monitor with a 4-in. nozzle was used. The low cost was possible only in the absence of boulder clay.

Yardage washed was 114,250 cu.yd. Piping time in days of 24 hours was 53 days. Duty of water, inclusive of stacking tailings and cleaning bedrock, was 38.5 cu.yd. to 1 cu.yd. of gravel.

In another instance, in a buried channel cutting across the modern creek bed but below its level, an elevator working under a 300-ft. head was employed to lift gravel 42 ft. to the elevator sluice, the ground for which sufficient natural dump could be obtained having been previously stripped. Boulders over 18 in. in diameter were removed and stacked by a dragline from a grizzly placed at the head of the lower, or bedrock, sluice. In yet another case, in ground also below creek level, the dragline shovel was employed in lifting gravel into a hopper, where it was sprayed thoroughly and sluiced by water under a natural head. Large boulders were rejected by a grizzly and the remaining tailings were stacked at the tail of sluice by a monitor with a 4-in. nozzle. Bulldozers were employed to bring gravel to the dragline, and the bedrock was finally cleaned by hand. Both operations were economical in actual working costs, but were short lived.

The total cost of the whole mining operation, per cubic yard, including the elevating and draglining previously mentioned, during the three seasons is given in Table III. At least two of the six pits were worked simultaneously.

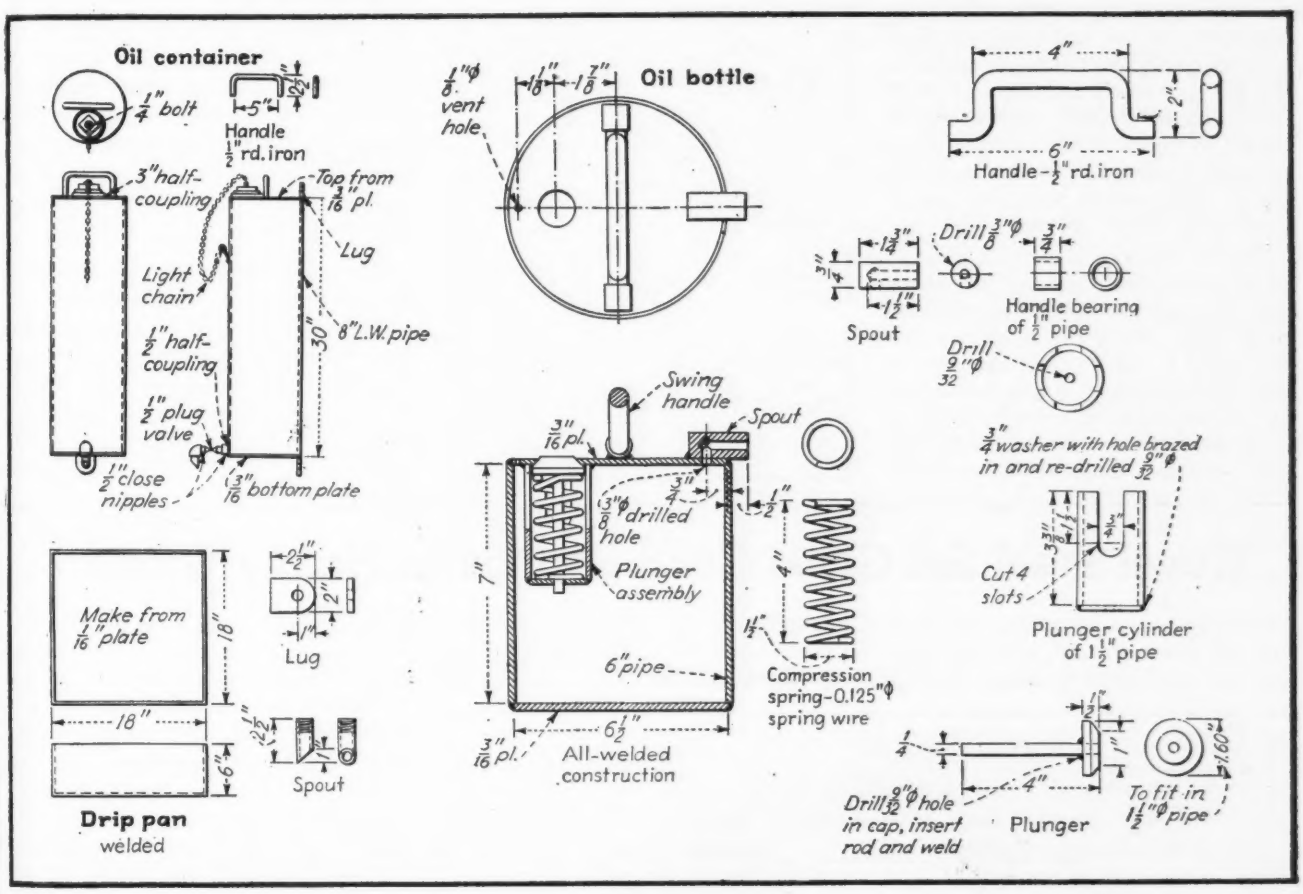
Experience gained on this creek emphasized the desirability of using the largest possible monitors with amply adequate pipe lines in the presence of coarse wash, tenacious boulder clay, and rough bedrock. It is thought that the use of larger nozzles than those actually employed would have much reduced the foregoing costs, particularly those for drilling and blasting and cleaning bedrock hydraulically.

Table III. Complete Costs for All Pits. Seasons 1939, 1940, 1941

	1939	1940	1941	Average Cost for Three Seasons
	Per Cubic Yard in Cents			
Gravel washed (cu. yd.)	1,000,580	1,077,270	786,217	....
Auxiliary water ditching	.....	0.06	.....	0.02
Clean-up expense	0.17	0.09	0.14	0.13
Hand-cleaning bedrock	.....	0.18	0.18	0.12
Dragline operating	0.24	0.03	....	0.09
Drilling and blasting	0.61	0.71	1.47	0.88
Elevator (cost)	0.14	....	....	0.05
Elevator installation	0.09	....	....	0.03
Elevating	0.07	....	....	0.03
Dragline operation, hopper and sluice installations	0.05	....	....	0.02
Lighting expense	0.02	0.01	0.03	0.02
Moving lighting plant	0.02	....	....	0.01
Nozzlemen	0.70	0.60	0.80	0.69
Pipe lines	0.28	0.52	0.32	0.38
Pre-season expense	0.22	0.08	0.05	0.12
Sluice building	0.38	0.26	0.46	0.36
Sluice tending	0.36	0.32	0.26	0.31
Shutdown expense	0.01	....	0.02	0.01
Truck and tractor operating	0.47	....	....	0.17
Miscellaneous	0.04	0.03	0.19	0.08
Prospecting (drilling)	.....	.....	0.07	0.02
Total pit costs	3.87	2.89	3.99	3.54
Auxiliary operations	2.81	1.90	2.48	2.38
Overhead and general expense	2.98	2.35	3.03	2.76
Total operating charges	9.66	7.14	9.50	8.68
Depreciation	2.73	2.48	3.97	2.97
Depletion	1.63	1.57	2.15	1.75
Total costs	14.02	11.19	15.62	13.40

OPERATING IDEAS

Improved Oil Bottle Lessens Spillage



SOME ADVANTAGES over the tall variety of oil bottle commonly used for carrying rock-drill lubricant into the working place are possessed by the bottle designed and constructed by A. R. Farrell, mechanical superintendent for Kirkland Lake Gold Mines, Ltd., Kirkland Lake, Ont. As shown in the drawing, it is of all-welded construction and is made of a 7-in. length of light-weight pipe 6 in. in diameter with a self-closing filler valve and a spout on the top end. A swing handle is provided.

Its squat shape makes this bottle less likely to upset, thereby decreasing the spillage common with the tall type. It cannot spill unless it falls on its spout. The self-closing valve helps keep dirt out. The stout construction, moreover, gives resistance to abuse. Several dozen such bottles have been built at small cost and are in use in the mine. A substantial saving of oil is said to have resulted.

The bottle is filled through the 1-in. hole in the top. This is kept closed by the spring valve which is housed in the slotted cylinder welded to the under side of the top, as shown. A $\frac{1}{8}$-in. vent hole in the top permits escape of air. In addition to their usefulness to the miner, these bottles offer the advantage of ease of construction in the average small mine shop.

Construction proceeds as follows: The bottom, of $\frac{3}{16}$-in. plate, is welded to the 6-in. pipe. To the disk that will be used for the top, also of $\frac{3}{16}$-in. plate, is welded solidly the spout, made of $\frac{3}{4}$-in. round stock bored with a $\frac{3}{8}$-in. diameter hole. A $\frac{3}{8}$-in. hole is then bored through this plate and into the spout to meet the longitudinal hole. The 1-in. diameter inlet hole is then bored, and its sides are chamfered at 45 deg. to conform to the valve that is to be installed beneath it.

Next, the spring (which has been wound on a lathe in the shop) and the valve plunger are installed in the plunger cylinder as shown, and the cylinder is welded centrally under the 1-in. hole.

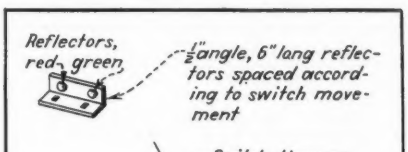
The handle is then welded to the top and the top itself is welded to the 6-in. pipe, completing the bottle.

To fill the bottles, a 5-gal. container, made of 8-in. pipe, is provided in each station or other convenient place, bolted to a timber some distance above the floor with a drip pan beneath. Container and pan are of welded construction, as shown in another drawing. Of chief interest is the spigot, consisting of a $\frac{1}{2}$-in. plug valve, two close nipples, an elbow, and a spout. The last is a $2\frac{1}{2}$-in. length of $\frac{1}{2}$-in. pipe with the end cut at 45 deg. to permit oil to flow into the bottle when the latter's spring valve is pressed against it. These containers are filled at intervals by a service man. The drillers fill their bottles themselves and in turn fill the air-line oilers from the bottles.

Reflectors Show Switch Position

For use on electric switches that are normally operated from a distance, Louis Roskovich, electrician and motor boss of the Lorain Coal & Dock Co., Blaine, Ohio, suggests a safety device for indicating switch position shown in the accompanying sketch. It consists essentially of two reflector sets, each with red and green reflectors, spiked to the tie on which the switch points rest. Shields welded on the switch points, as shown in the drawing, cover and uncover the reflectors as the switch points are moved, and the switch position is clear to the motorman.

In case a bolt or lug should break so that one switch point fails to move, one red and one green reflector will show, thus warning the motorman that the switch is out of order, and preventing derailments that might involve injury or damage to equipment. The cost is about 20c. for the four reflectors; other materials are from the scrap pile.


Reflectors, red, green
1½" angle, 6" long reflectors spaced according to switch movement
Switch-thrower
Shield welded on switch
Red reflectors show on turn. Green reflectors show on straight
Reflector mounting spiked to tie

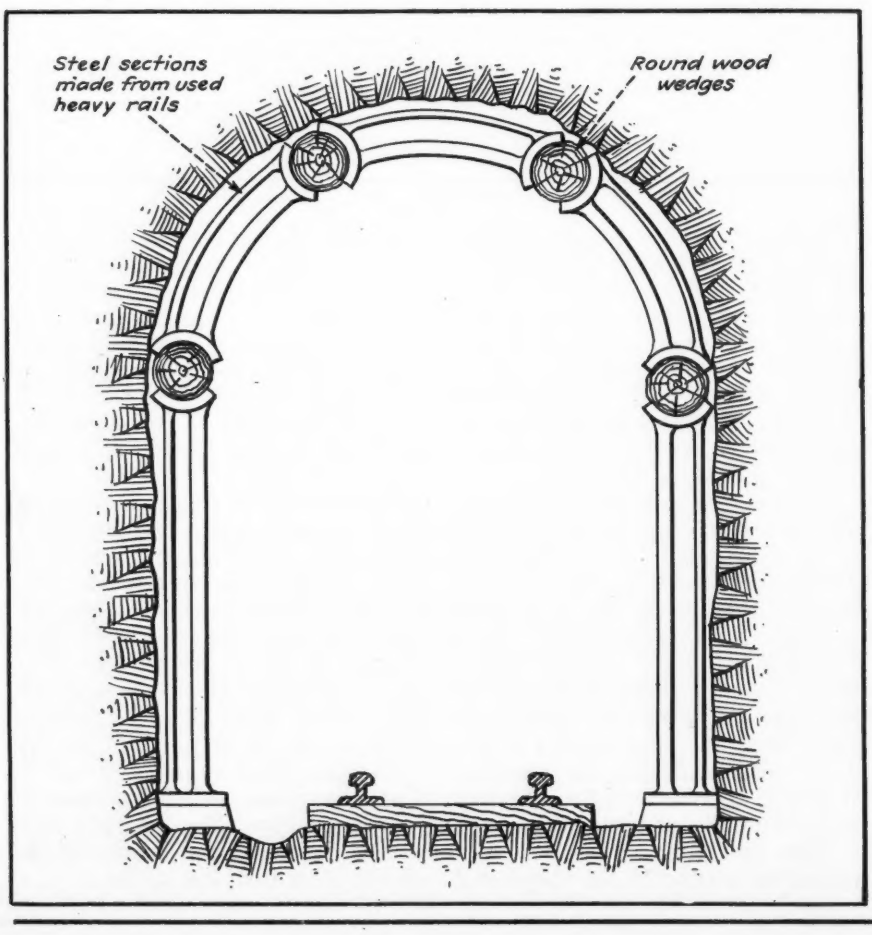
Old Hogan's Goat

The recently defunct but unlamented song about the dietary preferences of goats, mares, and little lambs always reminded us of a much older song about a goat whose tastes were not limited to oats. Having been tied to a railroad track in punishment for eating three of his master's red shirts, this goat did not despair. The wily animal merely coughed up the red shirts just in time to flag the onrushing Express.

Now, this is the type of resourcefulness we like to feature in this department. If you have used similar ingenuity in solving some operating problem, why not help other members of your industry by telling them about it in these pages? E.&M.J. pays $5 for every such idea used.

Novel Steel Set Gives Good Service in Heavy Ground

Providing drifts, crosscuts, and tunnels in heavy ground with adequate and safe timbering is always a difficult and costly job. Once this has been accomplished the worries of the mine superintendent have by no means ended, for there still remains the matter of proper maintenance. If conventional timber sets are used, frequent inspection is necessary and replacement of damaged posts and caps high, affecting adversely over-all mining costs.



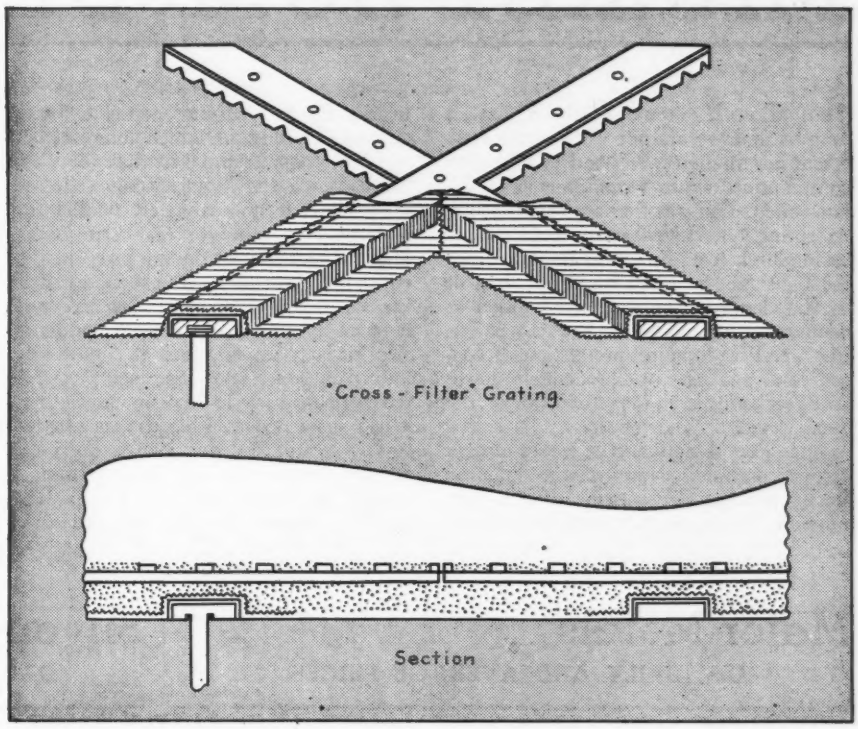
A. Ziffzer, mining engineer, Pittsburg, Kansas, recommends use of the steel set shown in the accompanying illustration which is giving satisfactory service in many mines in Europe. As will be seen, it consists of several sections of used heavy rail with welded-on semicircular steel plates or flanges. Each section when put up in the mine opening is separated by a round wedge, usually a short piece of stull, which gives the entire structure a flexible character. The "give" they provide prevents distortion of the sections supporting the roof of the opening, and as a consequence loss of a set, as is so often the case at mines where wooden structures are used, is a relative rarity.

When roof pressure has crushed the wedges to a point where the flange ends of the steel sections almost meet, maintenance men chip sufficient material from the roof of the mine opening to permit raising the jammed section and subsequently insert new wedges. The restored set is good until the wedges are crushed again, necessitating the repair job described. Recovery of sets after abandonment of a drift is almost 100 percent.

Long Lived Filter Grating for Sand Leaching Vats

REPORTING ON the operation of the cyanide plant of Nando Syndicate, at Unsweswe, Southern Rhodesia, in a paper read before the Institution of Mining and Metallurgy in London last year, Stanley J. Nathan described a useful filter grating for cyanide leaching vats. His description follows:

"The usual tank filter, consisting of shovelling slats, filter cloth (grain bags), and grid, was found to be costly in grain bags and labor, necessitating renewal of three filters per month, each requiring 30 bags. A grid in the form of a Maltese cross was then devised, as shown in the accompanying sketch. One wing of it was placed over the solution discharge pipe, and the whole was covered by only 9 grain bags, per 20 ft. diameter tank, sewn to shape, held down by coarse river sand and protected by shovelling slats. It was installed at one-quarter of the original cost of the usual grid, and was found to give at least equally good leaching. The sack filter has not required renewal in any of the tanks in the last year."

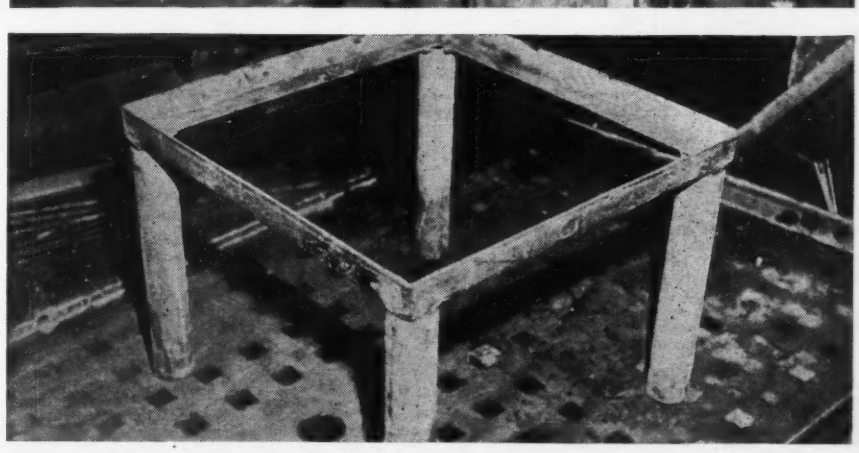


Open-Top "Table" Simplifies Flame Cutting

WITH THE arc-welded cutting table shown in the accompanying photographs, it is possible to lay plate steel out flat and cut repair parts from it without either moving the plate or ruining the table, according to Charles Apacki, foreman of the maintenance welding shop of R. G. LeTourneau, Inc., Peoria, Ill.

The table consists of nine pieces of scrap 9-in. tubing, each cut to 18-in. in length, and the group tack-welded together as shown. The frame of the table is made of 2 x 2 x ¼-in. angle iron, welded into a 27-in. square, and with an 18-in. length of 2½-in. pipe welded to each corner as a leg. When the pipe unit is set into the frame, the resulting table is 36-in. high.

Material cost amounted to $2.31, labor came to $4.95. When long usage roughens the table top, the pipe unit can be turned over. When this new surface is roughened in turn, 2-in. can be cut from the ends of each pipe to renew the table's usefulness. The pipes serve to guide sparks and slag straight through to the floor. This idea was a prize-winner in a monthly contest conducted by Robert Brothers Co., Troy, Ohio, manufacturers of arc welding equipment, and the data and photographs were furnished by them.



MARKET SUMMARY

THOUGH FINAL FIGURES for the first six months of 1944 are not yet available, sufficient information is on hand to show that consumption of non-ferrous metals in the Jan.-June period was the largest on record. Excepting quicksilver, prices held to the ceiling levels fixed by OPA. Production of the light metals was curtailed because of an abundance in supplies, conservation of manpower, and savings in fuel and power. The trend in domestic production of copper, lead, and zinc was moderately downward, reflecting a shortage of labor at the mines, smelters, and refineries.

Since March, domestic deliveries of copper to consumers (foreign and domestic metal) averaged more than 150,000 tons a month. Trade estimates indicate that deliveries for the half-year period will total around 850,000 tons, which compares with 841,857 tons in the first half of 1943. Since March the Metals Reserve Co. has been releasing approximately 60,000 tons of copper monthly to take care of the huge requirements of the war program. The emergency stockpile, which increased in the first two months of the year, has been reduced appreciably in recent months, in spite of large importations of copper from Latin America. The Combined Raw Materials Board early in May announced that it had again reviewed the copper situation and it regards the position of the metal as tight, urging that production from all sources be maintained "as far as practicable." Imports from Canada and Africa will be increased, if necessary.

Lead business was active during May, and the trade believes that monthly consumption must be averaging around 70,000 tons. A shrinkage in domestic mine output, resulting from manpower shortages, has been offset by allotting larger tonnages of foreign metal to consumers. During the last month, WPB released 23,000 tons of foreign lead to round out domestic needs. Action on demands of Mexican mine workers was postponed, and production in Mexico was maintained throughout the month of May.

The April statistics of the American Zinc Institute showed stocks of 218,598 tons, which compares with 108,042 tons a year ago. Producers believe that output will

Major Metals

U.S. DAILY AND AVERAGE PRICES

1944	Electrolytic Copper		Straits Tin	Lead		Zinc
May	Domestic (a) Refinery	Export (b) Refinery	New York	New York	St. Louis	St. Louis
1	11.775	11.700	52.000	6.50	6.35	8.25
2	11.775	11.700	52.000	6.50	6.35	8.25
3	11.775	11.700	52.000	6.50	6.35	8.25
4	11.775	11.700	52.000	6.50	6.35	8.25
5	11.775	11.700	52.000	6.50	6.35	8.25
6	11.775	11.700	52.000	6.50	6.35	8.25
8	11.775	11.700	52.000	6.50	6.35	8.25
9	11.775	11.700	52.000	6.50	6.35	8.25
10	11.775	11.700	52.000	6.50	6.35	8.25
11	11.775	11.700	52.000	6.50	6.35	8.25
12	11.775	11.700	52.000	6.50	6.35	8.25
13	11.775	11.700	52.000	6.50	6.35	8.25
15	11.775	11.700	52.000	6.50	6.35	8.25
16	11.775	11.700	52.000	6.50	6.35	8.25
17	11.775	11.700	52.000	6.50	6.35	8.25
18	11.775	11.700	52.000	6.50	6.35	8.25
19	11.775	11.700	52.000	6.50	6.35	8.25
20	11.775	11.700	52.000	6.50	6.35	8.25
22	11.775	11.700	52.000	6.50	6.35	8.25
23	11.775	11.700	52.000	6.50	6.35	8.25
24	11.775	11.700	52.000	6.50	6.35	8.25
25	11.775	11.700	52.000	6.50	6.35	8.25
26	11.775	11.700	52.000	6.50	6.35	8.25
27	11.775	11.700	52.000	6.50	6.35	8.25
29	11.775	11.700	52.000	6.50	6.35	8.25
30	Holiday	11.700	Holiday			
31	11.775	11.700	52.000	6.50	6.35	8.25
			AVERAGES FOR MONTH			
May	11.775	11.700	52.000	6.50	6.35	8.25
May			AVERAGES FOR WEEK			
3	11.775	11.700	52.000	6.50	6.35	8.25
10	11.775	11.700	52.000	6.50	6.35	8.25
17	11.775	11.700	52.000	6.50	6.35	8.25
24	11.775	11.700	52.000	6.50	6.35	8.25
31	11.775	11.700	52.000	6.50	6.35	8.25
May			CALENDAR WEEK AVERAGES			
6	11.775	11.700	52.000	6.50	6.35	8.25
13	11.775	11.700	52.000	6.50	6.35	8.25
20	11.775	11.700	52.000	6.50	6.35	8.25
27	11.775	11.700	52.000	6.50	6.35	8.25

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

1944	Sterling Exchange		Silver		Gold	
May	"Checks" (Nominal)	"90-day demand"	(c) New York	London	London	(d) United States
1	401.000	(f)	44.750	23.500	168s	$35.000
2	401.000	(f)	44.750	23.500	168s	35.000
3	401.000	(f)	44.750	23.500	168s	35.000
4	401.000	(f)	44.750	23.500	168s	35.000
5	401.000	(f)	44.750	23.500	168s	35.000
6	401.000	(f)	(e)	(e)	(e)	35.000
8	401.000	(f)	44.750	23.500	168s	35.000
9	401.000	(f)	44.750	23.500	168s	35.000
10	401.000	(f)	44.750	23.500	168s	35.000
11	401.000	(f)	44.750	23.500	168s	35.000
12	401.000	(f)	44.750	23.500	168s	35.000
13	401.000	(f)	(e)	(e)	(e)	35.000
15	401.000	(f)	44.750	23.500	168s	35.000
16	401.000	(f)	44.750	23.500	168s	35.000
17	401.000	(f)	44.750	23.500	168s	35.000
18	401.000	(f)	44.750	23.500	168s	35.000
19	401.000	(f)	44.750	23.500	168s	35.000
20	401.000	(f)	(e)	(e)	(e)	35.000
22	401.000	(f)	44.750	23.500	168s	35.000
23	401.000	(f)	44.750	23.500	168s	35.000
24	401.000	(f)	44.750	23.500	168s	35.000
25	401.000	(f)	44.750	23.500	168s	35.000
26	401.000	(f)	44.750	23.500	168s	35.000
27	401.000	(f)	(e)	(e)	(e)	35.000
29	401.000	(f)	44.750	Holiday	Holiday	35.000
30	Holiday	(f)	Holiday	23.500	168s	Holiday
31	401.000	(f)	44.750	23.500	168s	35.000
			AVERAGES FOR MONTH			
May	401.000	.....	44.750	23.500	....	35.000
May			AVERAGES FOR WEEK			
3	401.000	.....	44.750	.....	....	35.000
10	401.000	.....	44.750	.....	....	35.000
17	401.000	.....	44.750	.....	....	35.000
24	401.000	.....	44.750	.....	....	35.000
31	401.000	.....	44.750	.....	....	35.000

Calendar week averages, New York Silver: May 6th, 44.750; 13th, 44.750; 20th, 44.750; 27th, 44.750.
(e) Not quoted (Saturday). (f) No quotation.

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.225c. per pound, the average differential for freight and delivery charges.

(b) Export prices are net at refineries on the Atlantic seaboard and include sales of domestic copper in the foreign market. Owing to the World War and the disruption of normal trade relations, our export copper quotations, since September, 1939, have been based largely on f.a.s. transactions, ex United States ports. We deduct .05c. from the f.a.s. basis (lighterage, etc.) to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c. per pound over the current market for Prime Western but not less than 1c. over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

(c) Silver other than newly-minded domestic, by Handy & Harman. Under Treasury order of July 6, 1939, the price on domestic newly-mined silver mined subsequent to July 1, 1939, was fixed at 71.11c. per troy ounce. Handy & Harman's quotations on newly-mined domestic silver, 999 fine was 70⅝c. throughout May.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

drop over the second half of the year, as labor shortages grow, but supplies will be adequate.

Primary output of aluminum in February was 148,800,000 lb., against 169,600,000 lb. in January, the Aluminum and Magnesium Division of WPB reports. Further cutbacks in production have been ordered. Primary magnesium output averaged more than 41,000,000 lb. a month during the first quarter of 1944.

Quicksilver was dull and the price was under pressure most of the month, declining to $110 per flask, New York, a drop of $10. As May ended some buying interest developed. Production was reduced from 4,400 flasks in January to 3,800 flasks in March. Apparent consumption averaged 3,566 flasks a month in the first quarter.

The Metals Reserve Co., effective May 15, 1944, established its selling basis for manganese ore at 85c. per long-ton unit of contained Mn, based on New York, Philadelphia, Baltimore, Norfolk, Mobile, and New Orleans. This price includes the duty. Sales ex Fontana, Provo, and Pueblo, 91c. per unit. Prices are subject to change without notice.

Miscellaneous Metals Monthly Averages

Average prices of miscellaneous metals for April and May.

(a) New York, packed in cases, in lots of 5 tons or more but less than a carload. (b) Nominal. (c) Producer's price for commercial sticks. (d) Average producers' and platers' quotations, (e) Special shapes sold to platers.

	April	May
Quicksilver, N. Y. flask	128.200	115.538
Antimony (a)	15.839	15.839
Antimony, bulk, Laredo	14.500	14.500
Antimony, bulk, N. Y.	15.265	15.265
Antimony, Chinese (b)	16.500	16.500
Platinum, oz. troy	35,000	35,000
Cadmium (c)	90.000	90.000
Cadmium (d)	92.500	92.500
Cadmium (e)	95.000	95.000
Aluminum, ingot	15.000	15.000

E & M J Price Index

Weighted index of non-ferrous metal prices (copper, lead, zinc, tin, silver, nickel, and aluminum). The average for the years 1922-1923-1924 equals 100.

1929	110.33	1936	73.45
1930	82.87	1937	90.86
1931	60.20	1938	73.67
1932	48.26	1939	77.71
1933	59.79	1940	79.22
1934	69.59	1941	83.49
1935	74.66	1942	86.80
1943	88.74		

	1942	1943	1944
January	85.39	88.74	88.74
February	85.90	88.74	88.74
March	85.90	88.74	88.74
April	85.90	88.74	88.74
May	85.90	88.74	88.74
June	85.90	88.74	....
July	85.90	88.74	....
August	85.90	88.74	....
September	88.74	88.74	....
October	88.74	88.74	....
November	88.74	88.74	....
December	88.74	88.74	....

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated

(June 1, 1944)

MISCELLANEOUS METALS

Aluminum, ingot, 99 plus per cent, lb	15c.
Antimony, domestic, spot, lb. 5 tons or more	15.839c.
Bismuth, ton lots, lb	$1.25
Cadmium, commercial sticks, lb	90c.
Calcium, lb., ton lots, 97 @ 98 per cent	$1.25
Chromium, 97 per cent grade, lb	89c.
Cobalt, 97 to 99 per cent, per lb	$1.50
Iridium, troy oz	$7.50@$8.50
Nickel, electrolytic cathodes, lb	35c.
Magnesium, 99.8 per cent, carloads, lb	20½c.
Palladium, troy oz	$24.00
Platinum, (Official quotation) troy oz	$35.00
Quicksilver, flask of 76 lb., 100 flasks or more	$110.00
Selenium, 99.5 per cent, lb	$1.75
Silicon, minimum 97 per cent, spot, carloads, lb	14.75c.
Tellurium, lb	$1.75
Thallium, 100 lb. or more, lb	$10.00
Titanium, 96 to 98 per cent, lb	$5.00

METALLIC ORES

Beryllium Ore, 8 to 12% BeO, f.o.b. mine, per unit(b)	$14.50
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry, 48% Cr_2O_3, 2 8 to 1 ratio	$41.00
48% Cr_2O_3 3 to 1 ratio	$43.50
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$4.75
Mesabi bessemer	$4.60
Old Range non-bessemer	$4.60
Mesabi, non-bessemer	$4.45
Lead (Galena) 80 per cent, Joplin, Mo., ton	$76.01
Manganese, Metals Reserve Co. sales price, per long-ton unit of Mn contained, 48 per cent, subject to premiums and penalties, effective May 15, 1944: 85c. (duty paid) New York, Philadelphia, Baltimore, Norfolk, Mobile, and New Orleans; 91c., Fontana, Calif., Provo, Utah, and Pueblo, Colo.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	45c.
Tungsten Ore, per unit of WO_3:	
Chinese, 60 per cent, duty paid	$24.00
Domestic, 60 per cent and upward	(a) $25.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	27½c.
Zinc Ore, Prime, 60 per cent concentrate, Joplin, Mo.; per ton	$55.28

(a) Prices at mines, small lots, usually several dollars less. (b) Correction: January and February $100 @ $120 per ton, nominal.

METALLIC COMPOUNDS

Arsenious Oxide (arsenic) lb	4c.
Cobalt Oxide, 70 @ 71 per cent, lb	$1.84
Copper Sulphate, 100 lb	$5.00

ALLOYS

Beryllium Copper, 2.5 to 3 per cent Be, per lb. of contained Be	$15.00
Ferrochrome, 65 @ 70 per cent per pound of Cr contained	13c.
Ferromanganese, 78 @ 82 per cent, gross ton	$135.00
Ferromolybdenum 55 @ 65 per cent Mo. lb. of Mo. contained	95c.
Ferrosilicon, 50 per cent, per lb. of contained Si	6.65@8.10
Ferrotungsten, 75 @ 80 per cent, lb. of W contained	$1.90
Ferrovanadium, per lb. of V, delivered	$2.70@$2.90
Silicomanganese, 1 per cent C, gross ton	$133.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canadian (Quebec) mines (U. S. funds), ton:	
Crude No. 1	$650@$758
Crude No. 2	$165@$385
Spinning fibers	$124@$233
Paper stock	$44@$49.50
Shorts	$14.50@$26.50
Vermont, f.o.b. Hyde Park:	
Shingle stock	$62.50@$65.00
Paper stock	$44.00@$53.00
Shorts	$14.50@$28.50
Floats	$19.50
Barytes, long ton:	
Georgia, crude	$8.50@$9.00
Missouri, 93 per cent $BaSO_4$, less than 1 per cent iron	$6.75@$7.25
Bauxite, long ton:	
Domestic, crude, 50 @ 52 per cent (not dried)	$5.00
Domestic, chemical, 55 @ 58 per cent	$7.50@$8.50
Domestic, abrasive, 80 @ 84 per cent	$16.00
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, bulk	$6.75@$8.00
Delaware, No. 1	$15.00
Feldspar, bulk, ton:	
Potash feldspar, 200 mesh	$17.00
Glass-spar, white, 20 mesh	$11.75
Fluorspar, f. o. b. mines, bulk, Kentucky and Illinois 85–5 per cent, all rail movement, ton	$33.00
Acid 98 and 1 per cent, bulk, ton	$37.00
Fuller's earth, F.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, f.o.b. Washington	$22.00
Mica—The Colonial Mica Co., agent for Metals Reserve Co., on recommendation of WPB, extended its arrangement to purchase domestic strategic sheet mica at $6 a pound up to Dec. 31, 1944. This applies to No. 1 and No. 2 qualities, sizes 1 x 1 in. and larger full trim, and sizes 1½ x 2 in. and larger three-quarter trim.	
Ocher, Georgia, ton	$19.00@$22.00
Pyrites, Spanish, per long ton unit of S, c i f. Atlantic ports	12c., nom.
Silica, in bags, 325 mesh, ton	$20.00@$40.00
Sulphur, Texas, mines, long ton	$16.00
Talc, f.o.b. works, ton:	
New York, double air-floated, 325 mesh	$12.00@$15.00
Vermont, extra white, 200 mesh	$9.50@$10.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50
200 mesh, cream colored	$26.00

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton: Basic	$23.50
Steel, base prices, Pittsburgh Billets, gross ton	$34.00
Structural shapes, 100 lb	$2.10

WASHINGTON REFLECTIONS

McGRAW-HILL WASHINGTON NEWS BUREAU

Authorities in Clash Over International Bimetallism

Testifying in favor of the Dewey bill for monetary stabilization on April 28, Francis H. Brownell, board chairman of American Smelting & Refining Co., recommended international bimetallism as a preventive for the monetary disaster which in his opinion will otherwise occur if the world relies on paper money after the war. According to Brownell, the gold standard collapsed because of an insufficiency in the physical volume of gold, which under bimetallism he would supplement with the world's stock of monetary silver. He estimated the world's stock of monetary gold at 960,000,000 oz. and the silver stock at 6,000,000,000 oz.

Under the plan advocated by Brownell, the government would peg the prices of both gold and silver, and would buy and sell freely at the established prices, less a small handling charge. He warned that the continued non-redemption of gold would eventually undermine public confidence in its value. He recommended that the price of silver should be determined only after the most careful study, and characterized the trade as believing that, were there a free market in silver today, the price would exceed one dollar per ounce.

Sol Bloom, chairman of the House Committee on Foreign Affairs, before which Brownell testified, after admitting that the subject was "all Greek" to him, requested Herbert Bratter, a well-known monetary specialist and former senior economic analyst for the Department of Commerce, to prepare a report on Brownell's testimony. In his report, made May 21, Bratter charged that the silver-mining interests are not interested in truly international bimetallism, but in protecting and enlarging the silver subsidy paid by the United States government.

Bratter expressed the opinion that there are no important idle hoards of monetary silver abroad, but that most of the silver held by foreign governments is in circulation as coin, and thus is not available for international settlement. He stated:

"In connection with Mr. Brownell's willingness to see the United States institute bimetallism all by itself, it is worth recalling that in the last century, while there was still a chance to get an international agreement on bimetallism, the pressure of Western mining interests and their willingness to see this country do it all alone led the European nations to step aside and let us do it all alone.

"The 'one-country' international bimetallism which Mr. Brownell would have this country adopt by Congressional action in the last analysis boils down to simply this —a unilateral stabilization of the world silver market after the war at a price of silver sufficiently high, in my judgment, to put the white metal out of the reach of the only peoples who may still desire to own some of it and instead to attract to the vaults of the United States Treasury whatever silver the outside world and our own silver-mining interests can scrape up and sell.

"Brownell and the silver bloc want us to go back to the horse-and-buggy age in international affairs. He is shedding crocodile tears over the poor people of China, India, and the Far East, who, he says, would be the victims of currency instability.

"I wonder what he thinks of the depression and distress which the greed of the American silver bloc inflicted on China in 1934 and 1935. At that time, this government boosted the price of silver until the silver coins of more than a dozen foreign countries were drawn into the melting pot and exported to us as bullion.

"I do not recall that any bimetallist then offered a protest in behalf of the poor man. Instead, when China officially protested, Senator Key Pittman simply wired Washington that nothing must be done to interfere with the prosperity of the Western silver states."

The harsh view expressed by Bratter is a clue to the strong opposition that a proposal to embrace bimetallism at the pending monetary conference will face.

In the light of the warning uttered in *E.&M.J.* (Mar. p. 69), that domestic non-redemption and non-circulation of gold threaten its future, the views of Brownell and Bratter on the same subject are of interest. To quote Bratter further:

"As a mining man Mr. Brownell is rightly interested in the long-run future of gold. He asks how long mankind will preserve its belief in the value of gold if it is no longer in circulation and in common use as money? The fact is that almost everywhere a generation has been growing up that has not seen a gold coin in use—in the United States, in Britain, in Europe generally, in the Union of Soviet Socialist Republics, and in most other countries. If the people of the world do indeed change their views about gold, what of it? . . .

"The fact is with us gold has but one real remaining monetary use, the 'settlement of international balances.' It still has an important psychological value when mentioned in connection with monetary and banking statistics. But in this country gold is no longer the individual's medium of exchange or store of value. Even in jewelry and dentistry it has been losing out to other metals."

Meanwhile, it is rumored that Mexico is preparing to insist on international bimetallism in the forthcoming monetary conferences to be held in this country beginning July 1.

Stockpile Legislation Needs Dynamite

At this writing it seems as though something in the nature of a miracle will be required to cause the enactment of mineral stockpile legislation in this Congress. The Scrugham bill, the only one which has gone through hearings and has been modified accordingly, is lying in committee, with small chance of being reported out in the face of what amounts to Administration opposition. From now on legislation will be more or less of a "log jam," with Congress striving to clear its calendar and go home for electioneering.

If stockpiling legislation fails to pass this Congress, it is likely to face more difficulties as time goes on. The present Congress is war-minded. How interested the public or future Congresses will be in making appropriations for national security is a moot question. This is particularly true because taxpayer pressure for economy in government is likely to be strong enough after the war to compel politicians to give the issue more than the customary lip service. Parties whose experience goes back to the attempt in the twenties to convince Congress that stockpiling was in the national interest are skeptical that legislation will be passed at all if it is not done before the end of the war.

For the present stagnation of the stockpiling issue, people in the mining industry need not go far to find someone to blame. One compelling reason why Congress has shown small interest in stockpiling is that there has been no important amount of "grassroots" interest conveyed to its members. The industry's apathy over a matter so vital to its interests is a puzzle to its friends in Washington. Congress is so accustomed to pressure where vital interests are concerned that it habitually assumes failure to receive thousands of letters from the "home folks" to mean that the latter have no real interest in the matter at stake.

Another reason why stockpile legislation is bogged down is because the departments have been unwilling to seek a compromise on the Scrugham bill that would be acceptable to them (Reflections, April and May). As a matter of fact they have not even been able to agree among themselves, with the result that War and Navy had a bill. Interior had a bill, and State had a bill. These three bills were dumped into the hands of "Assistant President" Byrnes so that a compromise representing the Administration viewpoint could be worked out. However, about the same time the White House developed an over-all policy of avoiding controversial issues before election time, which has caused any departmentally sponsored legislation on stockpiling to be tabled.

To cap this situation, on May 5, Surplus War Property Administrator Will

Clayton testified before a Senate Military Affairs subcommittee that in his opinion such legislation should be delayed so as not to interfere with passage of the Murray-George bill covering war contract termination. The thinness of this excuse suggests that it is merely a front for policies which are as yet undisclosed.

If the President is reelected, it is entirely possible that Administration policy after election time may develop into opposition to any legislation on stockpiling, the preference being to leave the matter up to Executive discretion. This would suit the government - control - minded clique who continue to occupy influential positions in the government and would like to have discretionary power on stockpiling as a club over private industry.

There is still some possibility that stockpile legislation may be "jarred loose," but this will certainly not occur unless people in the mining industry communicate to Congress considerably more evidence of their interest than has yet been displayed.

Selective Service Policy Is Finally Clarified

After swinging violently from one extreme to the other, Selective Service draft policy settled down to an even keel when the new deferment regulations were announced on May 12. This ended eleven weeks of uncertainty on the part of industry in regard to the draft status of the labor force which began late in February when the President called for a tightening of deferments. A misunderstanding of the Army request for men in the younger brackets for combat replacements seems to have been the cause of the trouble. The Army's goal of 7.7 million men has already been reached.

When the situation finally was understood, an occupational deferment policy was established to provide the younger men in the right numbers and to defer greater numbers of older men for war production and other essential work. As Selective Service explained the policy to the local boards, "Under these policies, the prospect for registrants ages 18 through 25 is service with the armed forces unless they meet the specific conditions for deferment which have been established by the Director of Selective Service. The prospect for registrants ages 26 through 29 who are found to be 'necessary to and regularly engaged in' activities in war production or in support of the national health safety or interest, is that they will remain in civilian life for the time being subject to adjustment as the needs of the armed forces change. The prospect for registrants ages 30 through 37, regardless of their physical condition . . . is that they will remain in civilian life for an indefinite period, subject to adjustment as the needs of the armed forces change." From the age of 26 and up, fathers will normally be given preference over non-fathers for occupational deferments.

This policy will call for an overhauling of manning tables in accordance with the changed program.

International Monetary Conference Announced

The long-rumored international conference to discuss postwar monetary problems was called by President Roosevelt late in May. It is to be held in Bretton Woods, N. H., starting July 1. Invitations were sent to 41 nations and the French Committee on National Liberation. The United States delegation will be headed by Secretary of the Treasury Morgenthau. The meeting is to be known formally as the United Nations Monetary and Financial Conference.

Although the White House announcement did not go into detail, it is understood that two principal subjects are to be discussed—international currency stabilization and an international bank for reconstruction and development.

The tentative world currency stabilization plan, as unveiled in April, involves a stabilization fund of $8,000,000,000 in gold, to be used in maintaining international exchange stability. Inasmuch as international and domestic currency control tend to upset each other (*E.&M.J.*, April, p. 106), the question of how nations which refuse to accept the painful domestic consequences of international stabilization are to be persuaded or disciplined into conformity remains to be worked out.

The international bank for reconstruction and development, if it is considered, will be an added topic which has been described by Secretary Morgenthau as an "international Reconstruction Finance Corporation." This will also involve difficult problems of discipline.

The conference is a full-dress affair on the diplomatic level. "All agreements worked out at the conference will subsequently be submitted to the respective governments for approval."

Will Support Surplus Mineral Production

Although the raw-materials battle has been won, the policy of the War Production Board in regard to mineral and metal production is that all presently operating properties shall produce at their maximum capacity with the manpower available. Instructions to this effect have been given to the mineral divisions.

Government officials in charge of mineral production are in agreement that production must be maintained until the outcome of the European phase of the war is definitely known to be in favor of the United Nations. Any curtailment of operations at this time might prevent needed expansion of production later in case the invasion of Europe should go badly.

The international supply picture, as revealed by the second annual report of the Combined Raw Materials Board, parallels the domestic situation. Late in 1943 it was seen that the military effort was not likely to suffer from an insufficiency of raw materials. "Over the field as a whole, balance was being achieved."

"Toward the end of 1943," the report continues, "the Board was occupied with a situation which, highly satisfactory in itself, presented problems of a new kind: a number of materials had come into surplus supply and others were likely to do so. In the important field of metals, for example, the over-all supply position was generally easier at the end of 1943 than at any time during the two years of the Board's existence."

Continuing on the subject of surplus metals, the report states: "Moreover, at this stage, early in 1944, the degree of surplus itself cannot be forecast with complete certainty, and initial care is necessary to insure that the sudden cessation of high-cost or remote marginal production of a commodity, together with the easing of consumption margins, does not result in further deficits later on. In general it may still be said that the supply position for most commodities under allocation or review by the Board must remain under some measure of control until the end of the war."

New Post Created in Bureau of Mines

Organization of the Bureau of Mines has been revamped to create a new post of assistant director and to bring back into the fold most of the economic and statistical work on coal. George A. Lamb, former chief of the Economic and Statistics Division of Solid Fuels Administration for War, has been appointed to the new office by Secretary of the Interior Ickes.

In his new capacity Mr. Lamb is in general charge of the Economics and Statistics Service and Office of the Administrative Officer. Other functions of the Bureau of Mines remain under the general control of Dr. R. S. Dean, who continues as assistant director of the Bureau.

When the Guffey coal act was passed an expanded force was required to carry out its provisions and the work was moved out of the Bureau. With the expiration of that act the need for the setup in the Solid Fuel Administrator's office ceased to exist. The appropriation for the work expires June 30, 1944, the end of the fiscal year. Thus the problem created was easily solved by transferring the work back to the Bureau of Mines and by making provision for the cost of operation in the appropriation for the Bureau.

Mr. Lamb is 38 years old, and a graduate in economics of the University of Portland (Ore.) and of Yale University. He has had a varied career in government service, having seen duty with the Department of Agriculture, the National Recovery Administration, the National Bituminous Coal Commission, the Interstate Commerce Commission, and the Bituminous Coal Division before his assignment to the Solid Fuels Administration for War of the Department of the Interior.

Dr. R. R. Sayers, Bureau director, has announced that, "Mr. Lamb will direct coordinating programs and will administer the expanded activities of the Economic and Statistical Service of the Bureau." There has been no official announcement as to what the "expanded activities" are.

NEWS OF THE INDUSTRY

Copper Supply Is Viewed as Tight

Evidence that the copper supply situation is still tight, and will be so until the Invasion's success is assured, was furnished recently by an announcement of the Combined Raw Materials Board concerning the international copper position.

First point made in the announcement was that no production cuts are in prospect for the Northern Rhodesia copper mines, such as had been discussed earlier this year. (See *E.&M.J.*, Feb., p. 116, and March, p. 90.) The statement reads, "The United States' position has continued to be tight, and this situation has been worsened by the prospective decline in United States copper production because of manpower shortages."

Therefore, any production from sources hitherto allocated to the United Kingdom in excess of that country's agreed requirements will be made available in 1944 to the U.S.A. or the U.S.S.R. Production in Northern Rhodesia will continue "at the full rate obtainable without abnormal capital expenditure and taking into account available labor force."

Manpower Shortage Still Problem No. 1

Drafting of men 22 years of age and over engaged in mining copper, lead, and zinc must be stopped in order to avert a shortage of these metals, J. Reed Lane, Rocky Mountain regional deputy director of the WPB in charge of metals and mining, asserted May 22, following a day-long conference in Salt Lake City among officials of the WPB, the Army, Selective Service, and the War Manpower Commission. Mr. Lane said he would make a recommendation to this effect at once to A. H. Bunker, Washington, D. C., vice chairman of the WPB in charge of metals and minerals.

Similar views have been expressed privately by practically every mine operator in the country. In the Tri-State (See page 126) Eagle-Picher has been forced to close down three mines and one large mill for lack of men to operate them, and the company expects to undergo a 50 percent production cut at its Galena lead smelter for the same reason. In the Coeur d'Alene district, the Morning mine is reduced to one-shift operation and other mines may be forced to follow suit. It is reported that the district is already short about 1,200 men, and that the drafting of the 22 to 26 age group will remove another 400 men.

One particularly irritating feature of the new draft order is that it puts back into active duty many of the soldiers who were furloughed last fall for work in the mines. Many of these men were given to understand that their furloughs would be permanent so long as they continued as miners, and they therefore moved their families near their work, bought homes, and in other ways identified themselves with local communities. Uprooting these men has had a bad effect on their morale, and what is worse for the mining industry, on the morale of the remaining workers.

The effect of the draft has not as yet made itself felt in production statistics, although the latest quotations show a decline in copper and zinc in April. Producers expect a further decline, as a result of manpower losses, during the rest of the year. As pointed out editorially in *E.&M.J.* last month, p. 61, Army and Navy commands are certainly in a position to weigh men against metal, and they have apparently decided that their need for men is greater.

American Metal Sells Matahambre Holdings

American Metal Co., Ltd., announces that it has sold its entire holdings of Minas de Matahambre, S. A., consisting of 54,228 shares, to a group of Cuban citizens formerly associated with it in Matahambre as minority stockholders.

Spruille Braden, U. S. Ambassador to Cuba, announced in March that Minas de Matahambre would continue to sell 1,600 tons of copper per month to the United States through April, May, and June at 13.9¢ per pound. The announcement said that the mine had been on the point of abandonment for some time because it could not produce without premium price assistance, but no reference was made as to what plans had been made for the mine after June.

North Carolina Mining Activity Increases

Increased activity in the production of and search for minerals in North Carolina has increased the likelihood of the establishment of a State bureau of mines, but it is reported that Governor J. M. Broughton is awaiting completion of U. S. Bureau of Mines drilling programs before reaching a decision on the matter. The 1943 session of the North Carolina Legislature authorized the governor and the Council of State to set up such a bureau whenever they believed that mining activity in the State warranted it.

H. A. Brassert Co., of New York, recently completed a mineral survey of the State with encouraging results, and that company's work is being checked by the U. S. Bureau of Mines, whose parties are now drilling in iron-ore deposits in Avery and Lincoln counties, for tungsten in

Photo by Anagar Johnsen, Boise

FIFTY PERCENT of the tungsten mined in the United States now comes from this open pit of Bradley Mining Co.'s Yellow Pine mine, near Stibnite, Idaho. About 500 tons of ore is mined daily in the pit in 30x30-ft. benches, using 2-yd. shovels and diesel trucks. Fluorescent lamps are constantly used to distinguish ore from waste and permit selective mining

western North Carolina, and for coal in Lee and Chatham counties.

G. H. Espenshade, associate geologist of the U.S.G.S., who has been working out of the U.S.B.M. office in Henderson, N. C., reported recently that he had found between 100,000 and 200,000 tons of tungsten-bearing ore of minable quality in Vance County and in Mecklenburg County, Va. Mining operations in this area were begun last August by Haile Mines, Inc. (See *E.&M.J.* for Sept. 1943, p. 72), and by the R. G. Lassiter interests. Most of the early work was done in open pits, but shafts are being sunk to open the orebodies at depth. The tungsten-bearing mineral, hubnerite (manganese-iron tungstate), is found in crystals of a maximum length of 6 in. in a series of veins ranging from 1 to 30 ft. in thickness, and reaching a length of 1,500 ft. The richer veins contain between 0.5 and 1.5 percent WO_3.

The U.S.G.S. has also reported on a survey made by Mr. Espenshade, which describes a promising copper-zinc district surrounding the Hazel Creek mine, in Swain County, in western North Carolina. Copies of this report may be obtained by interested parties.

North Carolina possesses 82, or 59 percent, of the Nation's Class I and II mica mines, according to a recent WPB classification, and the State's division of mineral resources of the Department of Conservation has begun surveys in an effort to locate new mica deposits. Most of the State's mica mines are located in the western counties, and the search for new deposits will be made in eastern North Carolina, largely in Vance and Franklin counties. The first of the surveys is being conducted by William A. White, Assistant State Geologist.

Attempts to use Italian prisoners of war to work in the mica mines near Milton, N. C., have failed, inasmuch as the U. S. government has ruled that mica is a strategic war material and the use of prisoners in mining it would be a violation of the Geneva Convention.

American Zinc Co. Makes Good Record

American Zinc, Lead & Smelting Co. produced 100,602 tons of slab zinc in 1943, against 94,258 tons in 1942, an increase of 6.73 percent. Total production of slab zinc in the United States from both domestic and foreign concentrates increased 4.55 percent above the record for 1942.

This good showing for American Zinc was made despite the industry-wide handicaps of labor shortages and decreased efficiency of new employees. Loss of experienced men was felt most keenly by American Zinc's retort smelters. Labor shortage was particularly bothersome in the Dumas, Tex., smelter because of the several defense plants operating in that area.

Howard I. Young, president of the company, states that every effort has been made to keep development abreast of ore extraction, and that in Tennessee, for example, ore reserves, proved and indicated, at the end of 1943 were 42 percent greater than they were in January, 1940. Prospecting and development in the company's Tri-State and Washington operations were maintained at satisfactory levels.

Canadian Metal Statistics, 1940 to 1943

The Dominion Bureau of Statistics has released the following figures on Canada's production of metals for 1940, 1941, 1942, and 1943 (preliminary):

	1940	1941	1942	1943
Antimony, lb.	2,594,492	3,185,077	3,041,108	1,086,000
Cadmium, lb.	908,127	1,251,291	1,148,963	776,442
Chromite, lb.	335	2,372	11,456	30,085
Cobalt, lb.	794,359	263,257	(a)83,871	169,687
Copper, lb.	655,593,441	643,316,713	603,661,826	578,981,467
Gold, oz.	5,311,145	5,345,179	4,841,306	3,649,671
Iron ore, ton	414,603	516,037	545,306	641,294
Lead, lb.	471,850,256	460,167,005	512,142,562	444,354,772
Magnesium, lb.	.....	10,905	808,718	7,149,525
Manganese ore, ton	152	.....	435	.....
Mercury, lb.	153,830	536,304	1,035,914	1,709,000
Molybdenite (conc.) lb.	22,251	196,600	227,586	813,268
Nickel, lb.	245,557,871	282,258,235	285,211,803	287,763,825
Selenium, lb.	179,860	406,930	495,369	380,200
Silver, oz.	23,833,752	21,754,408	20,695,101	17,230,939
Tellurium, lb.	3,491	11,453	11,084	61,300
Tin, lb.	.....	64,744	1,237,863	(b)
Titanium ore, ton	4,535	12,651	10,031	73,723
Tungsten (conc.) lb.	12,002	82,846	520,981	1,353,089
Zinc, lb.	424,028,862	512,381,636	580,257,373	608,568,434

(a) Excludes metal in ore in government stockpile. (b) Not available for publication.

Phelps Dodge Output Increased in 1943

Mine production of copper by Phelps Dodge Corp. in 1943 was 478,319,109 lb., against 446,937,860 lb. in 1942, according to the annual report to stockholders. The 1943 output was 60 percent greater than in 1939.

Sales of copper amounted to 526,118,980 lb. in 1943, against 457,187,854 lb. in 1942. Totals include sales by Phelps Dodge Refining Co. for its own account.

At the Morenci branch of the company, 9,652,316 tons of ore was mined during the year in the Morenci pit and 31,104,037 tons of waste was removed. Truck haulage was confined to the upper benches of the pit, and at the end of the year, 16 benches were available for mining, with ore faces developed on the eight lower benches. The concentrator treated 9,577,595 tons of ore during the year. The entire new plant, built under the expansion program financed by DPC, began operating in February, 1944.

Primary Aluminum Output Reduced in February

Production of primary aluminum in the United States in February fell to 148,800,000 lb., 12 percent below the record for January, according to a recent announcement of the WPB Aluminum and Magnesium Division. Production cut-backs and the short month contributed to the decline. Total aluminum product shipments to consumers amounted to 206,700,000 lb., 41 percent more than a year ago, but 4 percent less than the Jan., 1944, peak.

The WPB light metals division also announced orders to close down in June four potlines at the DPC-owned, ALCOA-operated aluminum plant at Maspeth, L. I. This move will reduce U. S. production by about 12,000,000 lb. monthly, but will save about 750,000 tons of coal yearly. The only remaining aluminum plants in the New York area where electricity is steam-generated are one potline at Burlington, N. J., and the remaining lines at ALCOA's Massena, N. Y., plant.

United States Engineers Form Section of PAIMEG

When the First Pan American Congress of Mining Engineering and Geology was held in Santiago, Chile, Jan. 15 to 23, 1942 (*E.&M.J.*, Feb. 1942, p. 108), it was decided to organize a Pan American Institute of Mining Engineering and Geology (PAIMEG), with headquarters in Santiago and with national sections in each country in the Western Hemisphere. Since that time national sections have been formed in Argentina, Bolivia, Brazil, Chile, Peru, and Uruguay.

In order to support the aims and purposes of PAIMEG in the United States, a national section has now been formed under the direction of a steering committee headed by Edward Steidle, Dean, School of Mineral Industries, Pennsylvania State College. The organization meeting was held in New York, April 17, 1943, at which the following officers were elected as a national directorate: Chairman, Edward Steidle; vice chairman, C. W. Wright, Bureau of

Mines; secretary-treasurer, A. T. Ward, mining engineer, New York City; directors, D. F. Hewett, U. S. Geological Survey; M. B. Gentry, Freeport Sulphur Co.; T. T. Read, School of Mines, Columbia University; W. E. Milligan, Yale University.

Membership in the section is invited on the part of all who are interested in the mineral industries and who wish to foster good will and better understanding among mining engineers and technologists in the Western Hemisphere. No initiation fee is required, and annual dues are only $5. All who pay 1944 dues before Dec. 31 will be recorded as charter members. Remittances should be made to the secretary-treasurer, 50 Church St., New York, N. Y.

New Mexico Mining Association Meets

More than 200 members and guests of the New Mexico Miners and Prospectors Association met in Albuquerque, N. M., April 21-22, to discuss the future of the mining industry in general and of New Mexico's mining in particular. Consensus seemed to be that, given a certain amount of government cooperation, the State's mining industry could look forward to a bright future, particularly in the mining of nonmetallics.

The closing banquet of the meeting was addressed by Pat McCarran, U. S. Senator from Nevada, who warned his audience to be on guard against attempts of government agencies to curb private mine development by withdrawing public lands from entry. He condemned any public lands leasing program that might require licensing of prospectors and miners in general.

Robert E. Vinson, former president of Texas University, spoke on taxation as related to New Mexico's mining industry. He pointed out that whereas the mineral deposits of most other Western states are regarded by many to be approaching depletion, those of New Mexico should be regarded as largely "potential deposits." The reason for non-exploitation of the State's minerals, he said, is that exploration and development, particularly by the small operator, have been discouraged by high taxes on these activities. Mr. Vinson closed by advising that the Association do its best to foster amendments to the State's tax legislation that would encourage prospecting and development and also give every assistance to the State's mining school.

Horace Moses, manager of the Chino Division of Kennecott Copper Co. at Hurley, was elected president of the Association to succeed F. O. Davis, treasurer of Potash Co. of America, Carlsbad. All other officers were reelected, including Albert P. Mracek, secretary.

Mexican Miners' Union Calls General Strike

About 75,000 workers in 105 mining and smelting companies in Mexico left their jobs on June 8 in a general strike that paralyzed the country's metal-mining industry. About 80 percent of the production capacity affected is owned by British and American capital.

The union had asked a 50 percent wage increase, which employers declared themselves unable to grant, holding that a 10 percent increase was the best they could do without breaking price ceilings. The union based its demands on an estimated 52.3 percent rise in the cost of living in Mexico.

The strike will not immediately affect the United Nations' war effort, because of large metal stockpiles now on hand in the United States.

Bolivian Tin Arrives Despite Local Unrest

Although political events in Bolivia continued to be obscured in a fog of rumor, shipments of tin concentrates from the country continued at a fair rate. For the first quarter of 1944, they were reported as 8,692 tons of fine tin, in contrast to 10,308 tons for the same period last year. The quota assigned the country in 1941 by the International Tin Committee was 11,692 tons quarterly.

This production of tin, although lower than the country's capacity to produce, was regarded by most observers as excellent under the circumstances. The Bolivian government, which seized power in a revolution last December, has undergone several changes, which involved ostensibly the expulsion of pro-Axis elements, and has yet to be recognized by the United States or any other country except Argentina.

Bolivian Foreign Minister Valdivieso announced on April 29 that his government had successfully disposed of a revolutionary plot and that all principals in the movement had been arrested. Senor Valdivieso named Mauricio Hochschild as one of the principal conspirators, but did not say specifically that Hochschild had been imprisoned. No definite information concerning Mr. Hochschild's whereabouts or activities is currently available in New York.

In recent weeks, the Bolivian government has been increasingly vocal in protestations of loyalty to the United Nations and in plans for improving the lot of its people. The U. S. State Department recently completed an investigation of conditions in Bolivia, the results of which have not been released except to the other Pan-American governments, and following consultation among the several governments, the position of the group and of the United States concerning Bolivian recognition will be announced. No hint of the State Department's attitude has been released, but many observers in Washington believe that recognition of the present government of Bolivia is not far distant.

Duplication Eliminated in Equipment Requests

Technical amendment of Preference Rating Order P-56, setting forth procedures by which mine operators apply for priority assistance in obtaining machinery and equipment, provides that Form WPB 1319 need not be filled when applying for priority assistance if another order prescribes a special application form, the WPB announced on May 24.

The change eliminates unnecessary duplication in filing. The amendment also makes it clear that Form WPB 1319 may be used by mine operators to obtain preference rating for equipment not listed thereon. It is also made clear that all priority assistance applications should be directed to the Mining Division, WPB, Washington, D. C., unless otherwise provided in the instructions for filling out Form WPB 1319.

Molybdenum Contract Cancelled in Canada

Because the molybdenum supply position has eased, it has been possible for the government to cancel its purchase contract with Indian Molybdenum, Ltd., the Canadian Department of Munitions and Supply announced May 6. The contract with the company, a subsidiary of Dome Mines, Ltd., called for the purchase of 2,000,000 lb. of molybdenum concentrate, but the present stockpile is viewed as satisfactory.

Discovery of the molybdenum deposit was announced on Oct. 24, 1942, and it was hailed as a find of immense importance to Canada. The orebody lies not far from the Micmac mine, in Quebec, and it was developed and brought into production by Dome Mines, Ltd., by the summer of 1943. Output, according to the announcement, has been satisfactory, but the former demand no longer exists.

United States Copper Statistics

(Copper Institute)
In Tons

	U. S. Production		Deliveries to Customers			Refined
	(a) Crude	Refined	(b) Domestic	Export	Total	(c) Stocks
1939	836,074	818,289	814,407	134,152	984,559	159,485
1940	992,293	1,033,710	1,001,886	48,537	1,050,423	142,772
1941	1,016,996	1,065,667	1,545,541	307	1,545,848	75,564
1942	1,152,344	1,135,708	1,635,236	.....	1,635,236	65,309
1943	1,194,699	1,206,871	1,643,677	.....	1,643,677	52,121
Jan. 1944....	(d) 95,424	92,781	101,779	.....	101,779	45,800
Feb. 1944....	(d) 95,713	87,128	124,532	.....	124,532	36,489
Mar. 1944....	(d) 101,289	99,118	156,083	.....	156,083	37,259
Apr. 1944....	92,037	95,280	155,877	.....	155,877	38,382

(a) Mine or smelter production or shipments, and custom intake including scrap. (b) Beginning March, 1941, includes deliveries of foreign copper for domestic consumption. (c) At refineries, on consignment, and in Exchange warehouses, but not including consumers' stocks at their plants or warehouses. (d) Corrected.

PERSONAL NEWS

H. Schweizer, M. T. Murray, and **John Coke,** of the staff of Geographical Exploration, of Denver, Colo., have been conducting exploration tests for iron ore in Iron County, Mich.

A. A. McLeod, recently manager of Mt. Bischoff Tin Mining Co., has joined the staff of King Island Scheelite Co., operating in King Island, Tasmania.

G. N. Helling, until recently manager of El Canada Mines Co., Ltd., at Tuquerres, Narino, Colombia, has been appointed assistant to the general superintendent of Compania Minera de Oriente, S. A. (Chapaltique), via San Miguel, El Salvador, C. A.

Henry Mulryan, consulting mining geologist, Los Angeles 13, has been elected president of Los Angeles Mining Co. The company is the owner of the Canadian group of asbestos mining claims in the McMillan mining district, 40 miles north of Globe, Ariz.

James Westwater, of the engineering staff of Cleveland-Cliffs Iron Co. at Ishpeming, Mich., was recently appointed assistant superintendent of that company's Princeton mine, at Gwinn, Mich.

Dr. S. A. Tyler, geologist, of Madison, Wis., and **E. L. Buetner,** mining engineer, recently of Tucson, Ariz., have joined the staff of the Jones & Laughlin Ore Co. in iron-ore explorations on the Marquette iron range.

O. A. Rockwell, efficiency engineer for Calumet & Hecla Consolidated Copper Co., is in charge of operations at the company's Iroquois No. 1 copper mine.

Dr. Víctor M. López, director of the Servicio Técnico de Minería y Geología of the Ministerio de Fomento, Venezuela, has recently been elected a Fellow of the Geological Society of London and a regional vice president of the Society of Economic Geologists. The latter distinction results from the valuable work done by Dr. López in the interests of geological science in Venezuela. Apart from his many contributions to the literature on Venezuelan geology, Dr. López was prominently associated with other well-known Venezuelan geologists in the foundation of the School of Geology in Caracas in 1938, and was elected its first dean. Since then the school has produced 27 graduates, who have given a good account of themselves in the field as junior geologists and topographers. He is at present endeavoring to form a Geological Society of Venezuela and has received the warm support of the many geologists employed in Venezuela. Under his direction a new geological map of Venezuela has been compiled, and it is hoped to issue this soon with an outline of the geology of Venezuela.

DR. VICTOR M. LÓPEZ

E. C. Rice, of Idaho Springs, has accepted a position as superintendent with the U. S. Gypsum Co. at Sweetwater, Tex. Mr. Rice is a graduate of the Colorado School of Mines.

David E. Cooper has joined the engineering staff of the Union Mines Development Corp., a new unit of Union Carbide & Carbon Corp., at Grand Junction, Colo. He was formerly assistant to the superintendent of the Floridin Co. at Quincy, Fla.

George L. Richert, mining engineer of Denver, has assumed his new duties as assistant mineral attache at the American embassy in Mexico City.

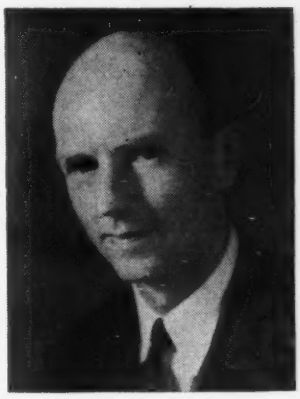
Robert E. Heineman, mineralogist in the Arizona Bureau of Mines for the past ten years, and for 16 years a member of the Bureau staff, resigned his post effective June 1. He joined the Bureau in 1928 as assistant geologist and had been identified while at the Bureau with the development of the use of ultraviolet light in mineral work.

George C. Bateman, formerly Canadian Metals Controller and now a deputy member of the Combined Production and Resources Board at Washington, D. C., was recently awarded an honorary LL.D. degree by his alma mater, Queens University, at Kingston, Ont.

Dr. John F. Thompson, executive vice president of International Nickel Co. of Canada, was recently awarded the Egleston Medal for "distinguished engineering achievement."

C. B. Dawson has been made manager of Newcor Mining & Refining Co. Ltd., at Flin Flon, Man. For several years he had been on the staff of the Metals Controller at Ottawa.

George A. Lamb, of Idaho, former chief of the Economics and Statistics Division of the Solid Fuels Administration for War, has been appointed to a newly created post of assistant director of the Bureau of Mines, and virtually all activities of the Economics and Statistics Division of the SFA have been transferred to the Bureau.



GEORGE A. LAMB

Dr. Clive E. Cairnes has been appointed assistant chief geologist of the Geological Survey by the Ottawa Department of Mines and Resources, succeeding **Dr. George Hanson.**

Edward S. McGlone, an alumnus of Colorado School of Mines in the class of 1923, was on May 26 honored by an award for "meritorious achievement in mining" by his alma mater, at the annual commencement of the School.

C. O. Hooker has been named successor to **Fred D. Kelsey,** who died on May 7, as superintendent of the Mesabi division of the Great Northern Railroad in Superior, Wis.

W. D. Webb, of the engineering staff of Pickands, Mather & Co., has been made assistant superintendent of Corsica iron mine, at Elcor, Minn., on the Mesabi.

Philip Bradley, Jr., of Jamestown; **F. C. Van Deinse,** of San Francisco.; **W. C. Browning,** of Los Angeles; **William W. Mein,** of San Francisco; and **George M. Hallock,** of Grass Valley, have been appointed to constitute a new State Mining Board for California.

Roy G. Scott, mining engineer, until recently engaged in iron mining in Minnesota, has joined the U. S. Navy.

C. E. Osburn, until recently superintendent of Rustless Mining Corp. Grey Eagle chrome mine, near Orland, Calif., has been transferred to the company's main office at Baltimore, Md.

Roy H. Elliot, consulting mining engineer, has resigned his position as supervising engineer with the mining section of

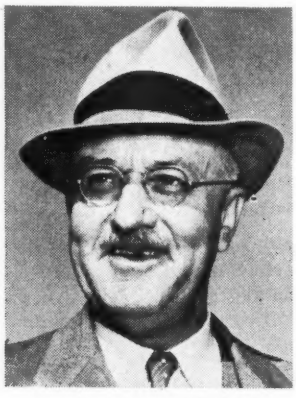
RFC, and has reopened his office in the Hobart Building, San Francisco, Calif.

Samuel H. Williston, vice president and treasurer, Horse Heaven Mines, Inc., and Cordero Mining Co., now makes his headquarters at the company's main offices established recently in the Mechanics Institute Building, 57 Post St., San Francisco, Calif.

Lynn Hersey has assumed the duties of general superintendent of mines for the Copper Range company, succeeding **Bernard Manderfield,** resigned. For the last two years he has been with the copper division of the War Production Board in Washington, D. C. Prior to that he was with Phelps Dodge, operating that company's Montezuma property, in Mexico. He received his early mining experience in the Coeur d'Alene district, in Idaho. He is a graduate of Idaho School of Mines.

Thomas Wills, captain of the Volunteer iron mine, at Palmer, Mich., has been transferred by Pickands, Mather Co. to the new Embarrass mine, on the Mesabi Range, as mine foreman.

A. C. Mackenzie, of Salt Lake City, manager of the Utah Metal Mine Operators' Association, in an address broadcast from Omaha, Neb., over the National Broadcasting Co. chain out May 13, emphasized the fact that metal mining is essential to civilization in peace and in



A. C. MACKENZIE

war. The program, a salute to the Western metal-mining industry, constituted the Union Pacific Railroad Company's "Your America" feature, celebrating the 75th anniversary of the completion of the first transcontinental railroad. In the course of his broadcast Mr. Mackenzie declared that "Man's welfare depends on the metals. The metals have met the challenge of the centuries and will meet every challenge of the future." The Utahn also related briefly the history of metal mining since prehistoric times.

Thomas C. Baker, Jr., former superintendent of the Plateros unit of the Fresnillo Company, Zacatecas, Mexico, left Mexico in November, 1943, to come to the United States. He became connected with the United States Bureau of Mines in College Park, Md., until last April, when he again made a change to accept a commission in the United States Naval Reserve as lieutenant (J.G.) in the Ordnance Bureau. He is now located at Fort Schuyler, New York 61, New York.

R. W. Hughes has succeeded **A. S. Winther** general manager of Miami Copper Co., and its wholly owned subsidiary Castle Dome Copper Co. Mr. Winther has been on sick leave for the past six months. He resigned on May 1 last. Mr. Hughes joined the company's staff in 1922, after several years' employment with Inspiration Consolidated Copper, and had been superintendent for eight years.

J. D. Harlan, formerly vice president and general manager of mines of United States Smelting, Refining & Mining Co., has been advanced to vice president and consulting mining engineer; **T. P. Billings,** formerly assistant general manager of mines, advanced to manager of Western mines; **L. A. Walker,** advanced to manager of Utah mines; **Byron (Buck) Grant,** formerly assistant to the manager of Utah operations, to general superintendent of operations at the company's Bingham and Lark mines; **J. B. Knaebel,** superintendent at Gold Hill, Utah, advanced to mining engineer under Mr. Harlan; **Don Willie,** formerly mine foreman at the Hidden Treasure mine, Ophir, succeeds **Mr. Knaebel** at Gold Hill.

Charles K. McArthur, metallurgical engineer, was recently appointed manager of the eastern sales division of The Dorr Company, with headquarters in New York, succeeding **Dr. C. L. Knowles,** who resigned to accept the position of technical director of the General American Transportation Co. Mr. McArthur had been a member of The Dorr Company staff of engineers since 1926, both at home and in foreign countries.

Arthur Swanson has left Rosiclare, Ill., to assume his new duties as general manager of the Jardine Mining Co. at Jardine, Mont.

E. E. Mason has been appointed superintendent of the Nickel Plate mine of Kelowna Exploration Co., Ltd., in succession to **C. B. Hume,** who is leaving for Ecuador to become chief engineer and geologist of South American Development Co. He was formerly on the staff of Island Mountain Mines Co., Ltd., and more recently superintendent of the Emerald Tungsten Project.

George Bacon, former Treadwell Yukon superintendent, has joined the exploration department of the Consolidated Mining & Smelting Co. of Canada, Ltd. He is currently prospecting in the Yellowknife area, N.W.T.

Fred E. Gray has returned to Nevada after spending several months in the Omineca district, equipping the Takla mercury mine for production. Mr. Gray was superintendent of the Bralorne mine prior to 1937, when he left to take charge of Desert Silver.

Harry Townsend, well-known Seattle geologist, is examining mining prospects in southeastern Alaska.

Frank B. Allen, president of the Allen-Sherman-Hoff Co., of Philadelphia, was awarded the Edward Longstreth Medal of the Franklin Institute on April 19 last.

FRANK B. ALLEN

This honor was bestowed on Mr. Allen for his invention of a "seal ring" for use in centrifugal pumps. Founded in 1890, the Edward Longstreth Medal has been awarded every year since for meritorious work in science and arts.

A. John Eveland, mine geologist and engineer, recently left San Francisco for Mexico City. He may be addressed at the American Club, Apartado 15-Bis, Mexico, D. F., Mexico.

Obituaries

Carl H. Klaustermeyer, manager of the Metal and Ore Division of Grasselli Chemicals Dept. of E. I. du Pont de Nemours & Co., an authority on the zinc industry, died on May 5 last at the age of 64. Mr. Klaustermeyer, was with the Grasselli organization 43 years.

J. M. W. Moore, 97-year-old former miner, who had lived in Arizona for the past 64 years, died on May 13 at Prescott, in that State. He settled in Prescott in 1880 and had been engaged in mining in the Big Bug district.

Gerret Bigelow, for many years chief of field exploration of Yuba Consolidated Gold Fields, died in San Francisco, Calif., on May 4, at the age of 72.

John E. Long, until his retirement several years ago prominent in California hydraulic mining circles, died recently in Nevada City, Calif., aged 81.

Thomas C. Foster, who had been State Mine Inspector of Arizona for 22 years, died in Phoenix, in that State, on May 25. He was in his 76th year.

Ross D. McCausland, 62, Colorado engineer and geologist, died in Denver on April 11, 1944. Mr. McCausland was part owner and manager of the Lark mine, at Silverton.

George D. Blood, consulting mining engineer, who played a prominent part

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in the development of the Park Utah property in Park City, Utah, died recently in Berkeley, Calif. Mr. Blood was a native of Plumas County, Calif., and received his education at the College of Mines, University of California, graduating in 1892. His professional career included professional work in Utah, California, and Nicaragua.

Harry A. Linch manager of the engineering department of The Dorr Company since 1933, died on April 29 last. He had initiated or collaborated in all the major mechanical developments of the company during the past decade.

Douglas Christopherson, formerly director and general manager of Consolidated Gold Fields of South Africa, and New Consolidated Gold Fields, died in England on March 6 last at the age of 75. He was in 1927 president of the Transvaal Chamber of Mines and his career was marked by long and distinguished service to the gold-mining industry of South Africa.

Charles D. Skillings, of Duluth, Minn., founder and publisher of *Skilling's Mining Review*, died on May 18 at the age of 82. He had long been a writer on mining and mine developments in Southwestern and Western mining states and on the Iron Country. He founded the *Review* in 1912 and had been its editor for 33 years.

John A. Monroe, Iron Country mining man, died at Iron River, Mich., on May 10. He was 69.

William Malcolm Corse, metallurgist and consulting engineer, died at Westmoreland, N. H., on June 3, at the age of 66. Mr. Corse was a graduate of M.I.T., and for 21 years secretary of the advisory committee on non-ferrous metals to the Bureau of Standards. He was a member of the A.I.M.E.

William Edwin McEwen, a mining engineer for many years associated with mining enterprises in Mexico, died at Yonkers, N. Y., on May 27, at the age of 67. He was an alumnus of Alabama Polytechnic College.

W. J. Power, who retired April 1 last as assistant general freight agent of the Great Northern Railway in Duluth, Minn., died in that city on May 11, at the age of 69.

William Henry Peirce, 78, metallurgist and engineer, who has been president of Baltimore Copper Smelting & Refining Co. for 42 years prior to his retirement several years ago, died on May 25 in Baltimore, Md. He was awarded the James Douglas Medal, one of the highest honors in the metallurgical field, in 1931.

SAMUEL D. BRIDGE

An Appreciation by Lewis A. Dunham

On March 8, 1944, Samuel Davenport Bridge died in San Antonio, Tex., at the age of 83. Mr. Bridge was born in Massachusetts and went right out of school to Butte, Mont., where he spent several years under Marcus Daly, Sr., as assayer and chemist for Anaconda Copper. He saw the early development of Butte and was in the entire confidence of Mr. Daly; many were the anecdotes he afterward told of the things he had seen at Anaconda in those years. The two which follow are typical:

Mr. Bridge had been appealing to Mr. Daly for a new assay office and had finally secured permission to build it. Two or three months later Mr. Daly returned from a journey east and looking out his office window saw a new two story house. "What is that new building?" he demanded. "Oh, that's the new assay office," was the reply. Said Mr. Daly, "First time I ever saw a two story assay office. Guess it will be assay office downstairs and dance hall upstairs."

One wintry morning—50 deg. below zero—Mr. Daly looked out his office window to see a tall man proceeding across the yard in a long, leisurely, lilting glide, when everyone else in the intense cold was stepping fast or running. "Who's that man going by out there?" demanded Mr. Daly. The answer was, "Oh, that's Tom Jones, who's working at the furnace." Said Mr. Daly, "Well, fire him! I don't like his walk."

Mr. Bridge married in Butte and took his bride to Monterrey, Mexico, where he started the "S. D. Bridge Assay Office" at No. 2 Zaragoza Plaza. This pioneering effort was a success, partly because the first smelter had just been started in Monterrey and mine owners from all over Mexico were sending their ores to that point. Many shipments came from the South, where silver miners found that the smelter could compete profitably with the "Patio" process. Mr. Bridge's assay office flourished until after the revolution of 1911. After the difficult times following the revolution Mr. Bridge seemed to retain the high regard of influential Mexican mine owners, so that he was able to carry on business there, completing several sales of mining property when other Americans found conditions difficult. Also he was able to return to Mexico after an interval and pursue the development and growth of his properties. After the death of Mrs. Bridge, a few years ago, he resided permanently at the University Club in the City of Mexico.

Mr. Bridge leaves a son, J. P. Bridge, of El Paso, Tex., and three daughters: Mrs. C. R. Hickox, New York City; Mrs. William W. Holden, San Antonio, Tex., and Mrs. H. D. Vigeon, Hobbs, New Mex.

A Tribute to John H. Collier

By William W. Logan

John Henry Collier, a prominent Western mining engineer, passed away at his home in Oakland, Calif., on Jan. 20, 1944, at the age of nearly threescore and ten years. More familiarly known to his friends and those of the profession as Jack Collier, he was born in Pioche, Nev. July 19, 1874, where his father, a noted silver miner and metallurgist of his time, was engaged in his calling. In 1879 the Collier family moved to Oakland that the children might have the advantage of the more progressive schooling that this city had to offer. Jack completed work at the Oakland High School and in 1893 entered the College of Mining at the University of California under the dean of mining, the late Prof. Samuel B. Christy.

After two years in college, Jack, due to financial circumstances, was compelled to take a leave of absence for two years and go to work. He secured employment at the Utah mine, at Angels Camp, on the Mother Lode, where he put in his time to good advantage both underground and in the mill. This practical experience and intimate association with fellow workers was to pay him handsome dividends in future undertakings. Friendships were started with mining executives that were to play an important part in his life. In 1899 Collier graduated with honors from the College of Mining at the University of California, receiving a B. S. degree He then became superintendent of the Tesla mine, near Livermore, Calif. This mine was noted for its heavy and treacherous ground, but when Collier left the property he had set an inimitable record for safety in mining. While at Tesla he met and married Lula Aylward, a daughter of a pioneer family of the Livermore Valley. The results of this union were three children, John Henry, Jr., Aileen, and Ronald.

Beginning in 1902 and for the next ten years Collier was superintendent for the Lassen Mining Co. at its gold property at Haydenhill, Calif. The mine was owned and operated by the Sloss Brothers and associates of San Francisco. After the Haydenhill mine was closed down, Jack entered more and more into consulting work. He took a great interest in the civil and social life of his community. He was a charter member of the Engineers Club of San Francisco, and he played a large and active part in the history of Western mining.

A LETTER

Photography in Drafting

The Editor:

I AM CONDUCTING EXPERIMENTS to determine the practicability of substituting photographs (bearing dimensions and other essential data) for a considerable portion of the sketches and drawings now being made in the understaffed drafting rooms of many plants concerned with pipe systems and other mechanical assemblies or details. Comment and suggestions are invited from others who may be interested in the matter.

HENRY G. HUBBARD.

c/o C. H. Jacobs,
1060 Mills Tower,
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REGIONAL NEWS

UTAH

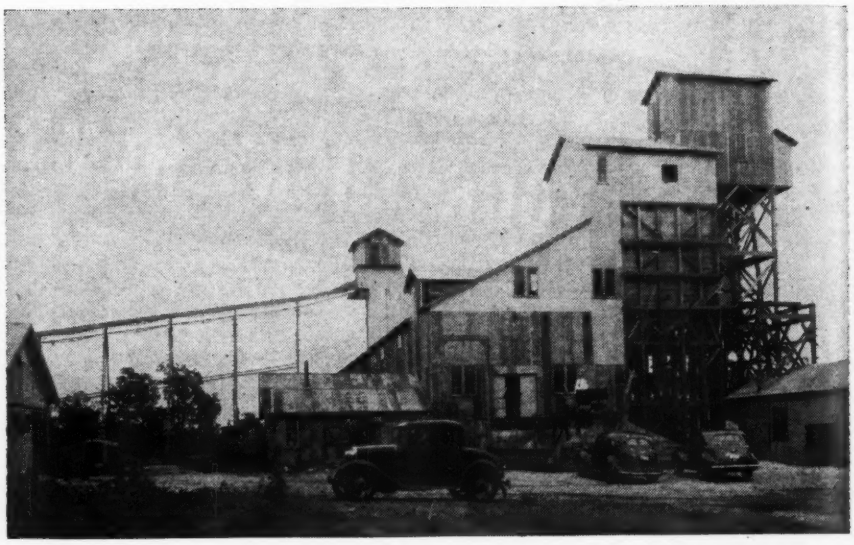
Utah Copper independent unions lose recognition—NLRB certifies MMSW at Magna and Arthur

▶ The United States Supreme Court refused April 24 to review the Tenth Federal Circuit Court decision which upheld a NLRB order requiring Kennecott Copper Corp. and its subsidiary, Utah Copper Co., to withdraw recognition from and disestablish employee groups known as the Mine Committee, the Mine Association, and the Mill Association. This refusal halts efforts of the company to secure legal recognition for the three long-established independent unions. NLRB has designated Mine, Mill and Smelter Workers Union Local No. 392 as collective bargaining agent for three groups of Utah Copper Co. employees at the Magna and Arthur mills, but has ordered further action to determine the agent for two other groups. The Board said the union won majority votes of employees of the electrical department, the central station, the boiler shop, the tin shop, the rigger department, and the remaining production and maintenance employees, including part-time employees. Employees in one of the other voting groups failed to give a majority to either the CIO union or Local 222, AFL teamsters' union, and no bargaining agent was certified. In the remaining voting group, ballots of 70 persons were challenged. The board overruled challenges of 51 votes. Preliminary count showed 100 favoring CIO, one for AFL, and 78 against both unions.

▶ Directors of New Park Mining Co., leading producer of zinc, silver, and gold in the Park City district, declared a dividend of 4c. a share payable June 1 to stockholders of record May 15. The company's annual report shows a net profit, before depletion, of $435,208, compared with $384,449 in 1942. Crude ore totaling 65,811 tons was shipped in 1943, compared with 49,947 tons the previous year. Gold totaling 19,892 oz. was produced, as well as 690,385 oz. of silver, 873,734 lb. of copper, 8,915,097 lb. of lead, and 12,083,216 lb. of zinc.

▶ Silver King Coalition Mines Co., Park City zinc-lead-silver producer, reports a net loss, after all taxes and depreciation, but before depletion, of $5,939.19, equal to half a cent a share, for the quarter ended March 31. Net profit for the year ended March 31, after federal income taxes totaling $17,712.40, was $108,936.17, or 8.9c. per share.

▶ Reports from the Crescent district, near Thompsons, indicate that the Potash Co. of America, drillers of four deep test wells near the Defense Plant Corp. well which disclosed the presence of oil and thick beds of magnesium and potassium, has removed all equipment and is disposing of well casing.



ZINC SILICATE ore is mined at a depth of 225 ft. by Southwest Mining Co. near Stark City, Mo., in the Tri-State field, and brought to this 450-ton mill for treatment. A crusher, rolls, jigs, and tables are used. Butane gas supplies power for an air compressor and the hoisting engine

▶ A smaller loss for 1943 was disclosed by the annual report of the National Tunnel & Mines Co., Bingham. Loss before depletion in 1943 was $366,596, compared with a similar loss of $632,596 for 1942. Other figures for 1943 (with 1942 figures in parentheses) follow: tons ore produced, 181,087 (67,519); copper, lb, 5,276,099 (2,052,750); lead, lb., 1,566,963 (619,433); zinc, lb., 669,064 (210,512); silver, oz., 58,031 (29,970); gold, oz., 1,750 (779).

▶ An appeal to the Utah State Supreme Court is being contemplated by metal-mining companies as a result of an opinion by the State Attorney General's office that federal premium payments should be included in figuring gross proceeds of metal mines for tax purposes. As a result of the opinion, approximately $11,000,000 has been added to the assessed valuation of Utah metal mines for 1944 property tax purposes. Last year the State Tax Commission ruled that premium payments should be excluded, but as a result of the opinion, the commission has been obliged to reverse its stand, Commissioner Roscoe E. Hammond pointed out. Under the law, valuation of metal mines is established at a figure equal to twice the net proceeds of the preceding year. The opinion, written by Assistant Attorney General Arthur H. Nielsen, held that premium payments should be included as part of the price received for the metals in arriving at gross proceeds, from which the net proceeds figure is derived. It is estimated that net proceeds valuation without premium payments will be $97,000,000, and with premium payments, $108,000,000. Last year's valuation was $93,159,446. The mine occupation tax, which is 1 percent of gross proceeds, also will be higher. Without premium payments it is estimated at $875,000, and with the payments, at $960,000.

▶ Appreciable quantities of bismuth ore have been developed by the mining division of the U. S. Bureau of Mines in the South Hecla mine, owned by the Alta United Mines Co., in the Alta district of the State. Stimulated by demand for bismuth created by the war, the division started exploration in August, 1943, following up geologic study, sampling, and mine rehabilitation by the company in November, 1942. The Bureau's development operations have exposed three faces of ore in the Sells section of the mine varying from 0.5 to 1 percent metallic bismuth. The ore zone also carries values in gold, silver, copper, and lead. Credit for the development is given to J. A. Marsh, district engineer; Paul T. Allsman, principal mining engineer; and John I. Kasteler, mining engineer, all under direction of S. R. Zimmerley, regional engineer for the Bureau.

▶ Privately financed development work has been resumed by the Mercur Dome Gold Mining Co. at Mercur after a several weeks' interruption to permit the U. S.

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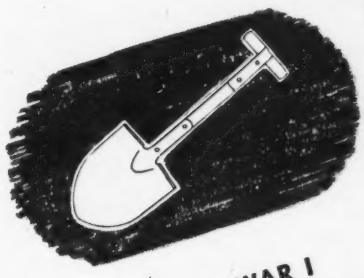

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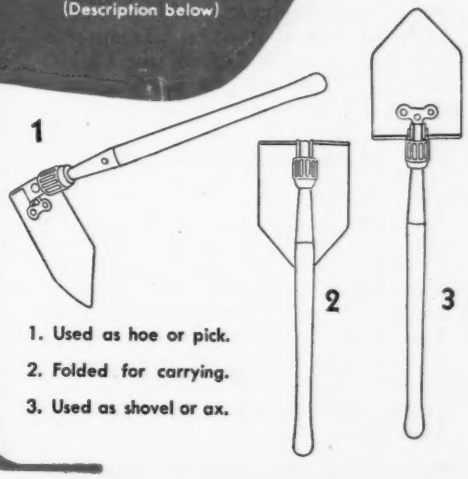

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Utah *(continued)*

Bureau of Mines to do some diamond drilling. A contract will be let for 300 ft. of drifting on the 950-ft. level to follow zinc and copper ore. Drifting east and west also is being resumed on a 5-ft. bed of vanadium ore on the 1,000-ft. level.

CALIFORNIA

Red Star hydraulic mine gets operating permit—New power line for Gold Bluff mine

▶ Hydraulic mining operations have been resumed by Red Star Mining Co. at the Red Star placer property near Michigan Bluff, Placer County, under an extension of a permit granted by WPB. Current work is centered on virgin gravel developed beyond the old workings, and enough gravel is reported available for several years' operation. D. M. Ray is president and general manager of the company.

▶ Rehabilitation work, including dewatering the shaft and clearing tunnels, preparatory to examination of underground workings, is to start soon at the Gruss mine, near Genesee, Plumas County, by Salt Lake City interests headed by A. E. Blackner and C. H. Dampf.

▶ Pacific Gas & Electric Co. has recently extended a power line to the Gold Bluff mine, in Sierra County, acquired last fall by the C. L. Best interests, of San Leandro. Current activities at the mine are centered in extending No. 4 tunnel to the nearby Oxford property, with a view of exploring known orebodies. Chrome mining continues at the Oxford, where a 100-ton mill is available for handling mine output. B. C. Austin, of San Francisco, is consulting engineer, and L. L. Huelsdonk, general superintendent, is in charge of operations.

▶ Chrome and manganese properties in the Mad River area of Trinity County are active again, following a winter shutdown. Western Metals Mining Co. is operating several mines between Ruth and Mad River, with C. Snyder, superintendent, in charge, and J. P. Warren has about 20 men employed at the Blue Jay manganese mines, situated on Three Forks and Mad River.

▶ Quicksilver, Inc., Oscar L. Mills, president, is reported to have resumed operations at its property in the Bodie district of Mono County, where work was halted during the winter months by adverse weather and deep snow. The quicksilver deposits under exploitation are in a sector of gold-silver claims formerly worked by Paramount Mining Corp., and were equipped last year with a reduction plant brought in from the mine of Castle Peak Quicksilver Co., near Virginia City, Nev. D. B. McAfee, manager, directs operations.

▶ The California Legislature's Postwar Rehabilitation Interim Committee, T. Fenton Knight, chairman, authorized under Assembly Resolution 190, held a public hearing in regard to current and postwar problems of the mining industry in Sacramento on May 23 and 24. A prominent part of the proceedings was a special representation of the mining committee of the San Francisco Chamber of Commerce, headed by George B. Dodge, through Robert M. Searls, B. C. Austin, Robert Beale, Albert F. Knorp, and G. L. Fox, manager of the Chamber's industrial department. The San Francisco Chamber of Commerce advocates the use and free exchange of gold as a monetary standard; a federal stockpiling plan; RFC loans to gold-mining companies to tide them through the war period; and continuation of past federal public-lands policies which have been favorable to the development of mineral deposits.

▶ Manganese Ore Co., wholly-owned subsidiary of M. A. Hanna Co., Cleveland, Ohio, has taken over the Halstead group of claims adjoining the property of Virgilia Mining Co. in Plumas County. The prospect will be explored and developed as soon as the gold mine closing order, L-208, is rescinded. Mack C. Lake, 206 Sansome St., San Francisco, Calif., is general manager of Manganese Ore Co.

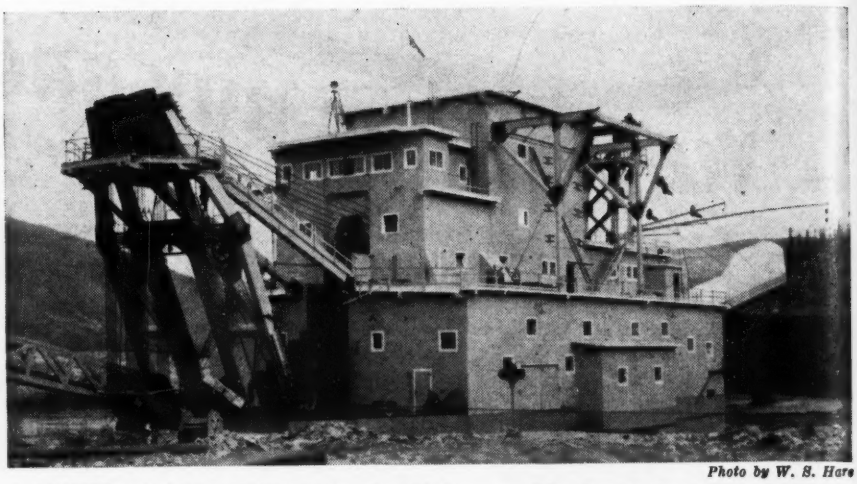

Photo by W. S. Hare

LARGEST GOLD DREDGE in the Yukon or Alaska is the 18 cu.ft. No. 4 dredge of Yukon Consolidated Gold Corp., Ltd., shown here working along Bonanza Creek near Dawson, Y. T. In addition to this dredge, the company expects to run at least two more boats this season, one on Quartz Creek and one in the Klondike Valley.

IDAHO

Lucky Friday prospects still good—New process studied at Stibnite—Morning cuts output

▶ Producing mines of the Coeur d'Alene district are compelled by a State law to file sworn statements with the county assessor by May 1 of each year, stating their gross tonnage production, gross value, cost of production, freight and treatment costs, net profits before taxes, and deductions for depletion and depreciation. This is done for the purpose of computing state taxes on mining property. Twenty-six companies filed statements this year covering operations for 1943, as against 23 for the year 1942. The three new mines are Callahan-Consolidated, Douglas, and Monitor, all zinc-lead producers. The statements show a total production of 1,820,156 tons for the year 1943 and net profits of $6,569,683, as against 2,243,797 tons and $8,441,236 net profits for 1942, showing a loss of 423,641 tons and $1,871,553 net profits. This lowered production is due entirely to the manpower shortage, for all of the producing mines should have turned out a great deal more tonnage under more favorable operating conditions.

▶ Lucky Friday Silver-Lead Mines Co. has received net smelter returns of $15,581.48 for 62 tons of lead concentrate and 32 tons of zinc concentrate. The minerals were recovered from 1,728 tons of development ore produced in opening the vein on the 800 shaft level. The lead ore was shipped to the A.S.&R. East Helena smelter and the zinc to the Sullivan zinc plant, at Kellogg. The lead concentrate contained a per-ton average of 309.8 oz. of silver, 35.50 percent lead, and 6.50 percent copper. Zinc concentrate averaged 53.80 percent zinc and 11.05 oz. in silver. This shipment brings to $130,421.97 the Lucky Friday receipts for ore mined in a prospect shaft. The oreshoot was narrow from the 300 to the 600 levels, but has lengthened to over 165 ft. on the 800 and shows commercial grade ore from 2 to 7 ft. wide. Ore shipped from the development to date totals 14,049 tons, all of which has been milled at the Golconda mill. The Lucky Friday is an unusual development for the reason that it has paid its own purchase price and development expense without aid from the stockholders. The mine is almost within

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Idaho *(continued)*

the city limits of Mullan, Idaho, and is owned largely by local stockholders.

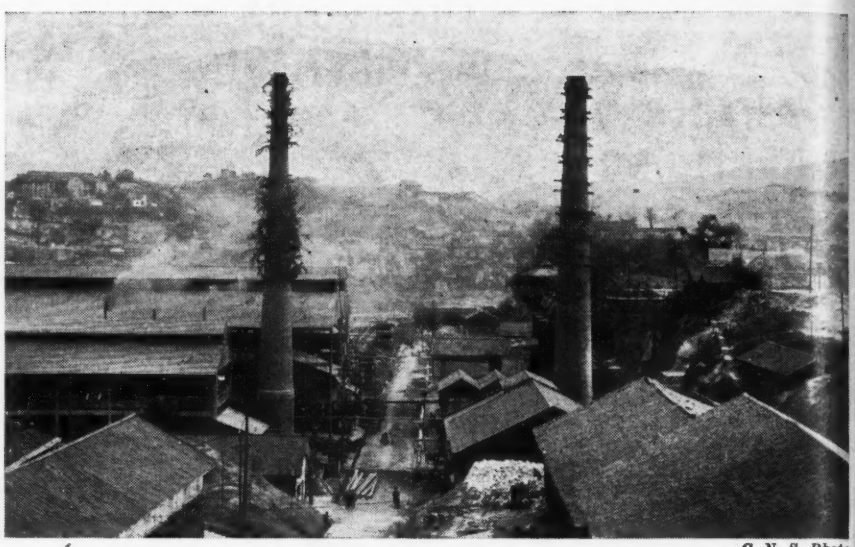
▶ Coeur d'Alene Mines Co. has opened its silver-copper-antimony vein in a crosscut from the 2,200 level, revealing an orebody 7 ft. wide. Three average samples of the ore at the point of contact contained 9, 10, and 12 oz. of silver in addition to unstated quantities of copper and antimony. In upper levels of the mine this oreshoot was approximately 500 ft. long, with good values in silver, copper, and antimony. From the 1,800 to the 2,000 level the ore gradually decreased in silver content, and reoccurrence of silver on the 2,200 level is therefore very encouraging. Other mines in the same belt have encountered lean zones in their orebodies on about the same horizon as shown in this shaft.

▶ Two Day-controlled mining companies, the Tamarack & Custer and Sherman Lead, have declared their first dividend for the year 1944, both payable on the same date, June 12, to stock of record May 20. The Tamarack dividend is for 3c. a share, totaling $150,000, and brings the total dividend record for this company to $2,542,123. The Sherman Lead dividend is for 1c. a share, amounting to $36,750, and brings the total dividends paid to date to $621,750. Outlets to both properties are in the Burke Canyon northeast of Wallace and both have new 150-ton milling plants.

▶ The Callahan Consolidated Mining Co. reports a net operating loss of $16,207.25 for 1943. However, the company is now on a profit-earning basis, according to Donald A. Callahan, president, and can continue thereon, "providing we are not too badly handicapped by lack of manpower," he stated in a letter to stockholders. "Recently we have developed a considerable body of ore," he said, "which is of somewhat better grade, and since April 3 of this year we have been operating our mill three shifts daily and have materially increased our shipments of concentrates to the smelter."

▶ Bradley Mining Co., operating a tungsten, antimony, and gold deposit at Stibnite, is now producing 50 percent of the domestic tungsten mined in the United States, according to James P. Bradley, vice president. The company is equipping a new tungsten-processing plant in Boise, capital of the State, for the purpose of increasing the tungstic oxide content of the concentrate from 45 percent, as it comes from the mill, to approximately 75 percent, which is required to meet individual specifications of consumers in the East. Hydrochloric acid, the principal ingredient used in the process, will be shipped in from San Francisco and the tungsten concentrate will be shipped by truck from the mine to Boise. The plant will have a capacity of 300 tons of finished product per month.

▶ In addition to its tungsten production, the Bradley company is shipping a byproduct concentrate containing gold, silver, and antimony, which is obtained in the treatment of the tungsten ore, and is experimenting on a smelting process at the mine for the treatment of this product. Under the direction of Harold D. Bailey, resident manager, and Robert J. McRae, chief metallurgist, the company has arranged an experimental smelting plant at the mine of one-ton capacity. If these experiments are successful, the company plans to build a smelter at the mine of sufficient capacity to handle the output.



C. N. S. Photo

CHINA'S IRON AND STEEL come largely from the Hsiang Kuo Shi works of the China Industrial Co., shown above. Situated on the north bank of the Chialing River near Chungking, the plant was designed and built by Chinese engineers and workers. About 1,500 men are employed, and capacity is 700 tons of pig iron per month. Blast furnace is behind right-hand stack

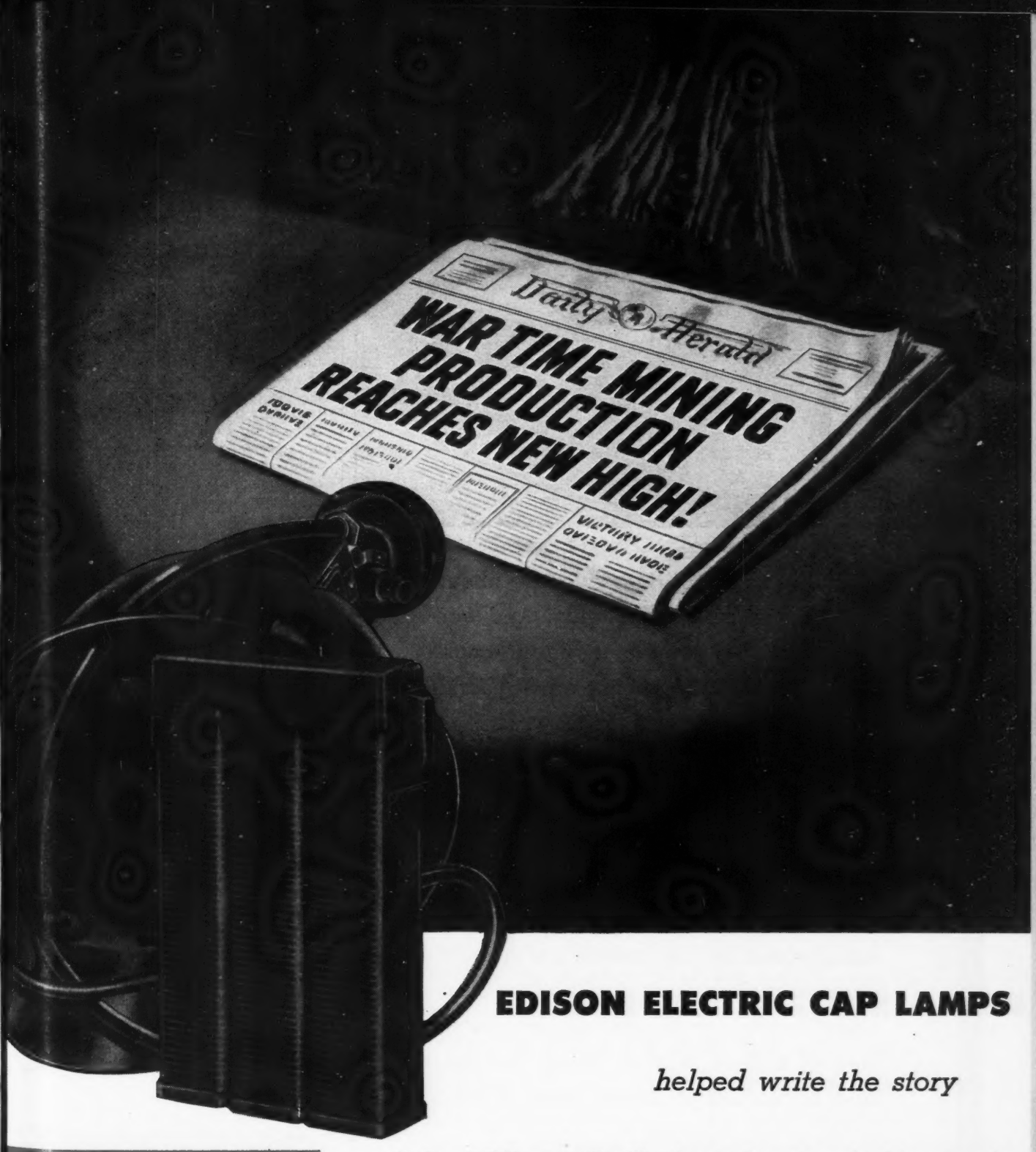
▶ Highland-Surprise zinc-lead mine, in the Pine Creek area of the Coeur d'Alenes south of the Bunker Hill, has received a "B-O" quota rating for lead and zinc production, replacing the "A-O" quota under which the company has been operating and which applied only to the lead output. The new rating is retroactive to Dec. 1, 1943, and back premiums are expected to net the company around $38,000. It is estimated the new "B-O" rating will increase the company's revenue from ore sales by at least $10,000 a month. The mine is a marginal producer and can hardly break even at ordinary zinc prices.

▶ Federal Mining & Smelting Co.'s Morning mine, at Mullan, which for several years held the position of the largest zinc-producing mine in the United States and which ordinarily employs around 1,000 men, has been reduced to a one-shift basis because of the existing acute manpower shortage and now employs fewer than 300 men. To keep its big 1,200-ton mill in operation, the company has been milling its old mine dumps and the entire production of the company's Frisco mine in addition to the restricted output of the Morning mine. The Frisco ore is hauled to the plant by truck from Burke Canyon, a distance of about 14 miles.

▶ Hecla Mining Co. is again producing zinc-lead ore from the Silver Cable mine, east of Mullan, on which Hecla holds a lease, after a four months' suspension forced by snow conditions. Operations at the Silver Cable last year from July to Dec. 31 brought Hecla a net profit of $46,050.44. The ore is trucked from the mine about 14 miles to the Hecla mill at Gem. Several other companies attempted to operate the Cable before Hecla took it over, but all were unsuccessful.

▶ Jack Waite Mining Co. reports a net profit of $68,402.37 before depletion, depreciation, and interest charges for 1943, compared with $45,448.45 in 1942. The mine is operated by A.S.&R. on a percentage basis and is in the Murray district on the high Bitter Root divide separating Idaho and Montana. Originally, the orebodies were located in Idaho, but owing to their dip and rake they extend into Montana, and all production is now coming from the Montana side. The concentrate produced at the company's mill at the mine is a high-grade lead product and is shipped by truck over two mountain ranges to Bunn Siding, north of Wallace.

▶ The Western mining states now produce 45 percent of the zinc mined in the United States, according to the latest report of the U. S. Bureau of Mines. The Central states produced 30 percent of the total, and the Eastern states 25 percent. Idaho was the leader among ten Western states, with a production record of 8,891 tons of zinc in March, against 8,708 tons in February and 8,395 tons in January, a total of 25,994 tons for the first quarter of 1944. Idaho's nearest rival was New Mexico, with a total production of 14,266 tons for the same period. The Bureau of Mines report says Idaho's zinc production has shown a small but steady increase in 1944 because of increased output from the Bunker Hill zinc-fuming plant, the Hecla



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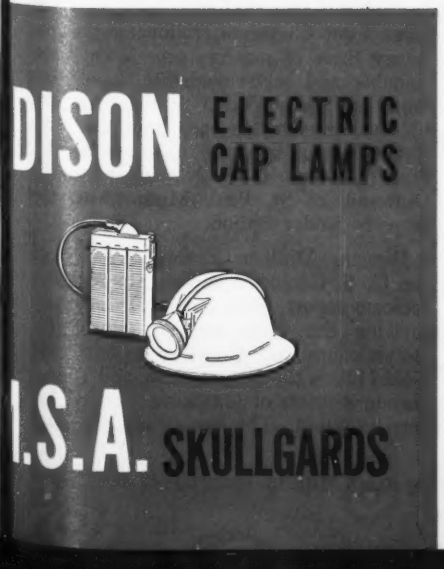

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Idaho *(continued)*

Mining Co.'s Osburn tailings operation, and new discoveries of zinc-lead ore in the Page, Blackhawk, and Frisco mines of Federal Mining & Smelting Co. There are, in addition, shipments of zinc ore and concentrates from several new small producers.

▶ In a preliminary report by Sunshine Mining Co. covering the first three months of 1944, R. D. Leisk, general manager, says mining operations are being confined to the newly discovered Chester vein system because of its high lead content. During the first quarter of the year 88 percent of total production came from this area, he says. From the 28,857 tons of ore treated, recoveries totaled 4,829,113 lb. of lead and 1,004,311 oz. of silver, which brought net smelter returns of $994,636.32. Work on the Sunshine vein has been completely stopped, says Mr. Leisk, and will not be resumed until sufficient labor becomes available. Since the switch to the Chester vein, Sunshine's lead production has increased 41 percent over the record for the last quarter of 1943.

COLORADO

Custom mill at Ouray—Mercury found near Gunnison — Snow slides cause damage near Ouray

▶ The Banner American mill, at Ouray, formerly operated by G. A. Franz, Inc., has been succeeded by General Ore Reduction Co., a Colorado corporation, with G. A. Franz, Jr., as general manager and president and R. K. Franz as mill superintendent. It has been converted into a full custom mill and will purchase custom ores from local operations.

▶ C. L. Brown, superintendent of the Koehler Tunnel, operated by Denver Equipment Co., has the property, which is at the top of Red Mountain Pass, in San Juan County, producing copper, zinc, lead, and silver. The ore is coming from development drifts driven into the downward extension of the Congress and San Antonio orebodies.

▶ Two engineers from St. Paul, Minn., have been investigating the Asahel T. Smith property, in Cochetopa Canon, 28 miles from Gunnison, following the discovery there of mercury ore. Two types, cinnabar and metacinnabarite, have been found on the property. A small retort of 1½ tons' capacity has been built and some of the mercury from ore on the surface has been extracted. O. F. Norton and O. T. Dufresne, of St. Paul, Minn., have the property under option.

▶ Director William Embry Wrather of the U. S. Geological Survey states that a geologic report, with accompanying maps showing the veins and geology of the molybdenum and tungsten deposits near Gold Hill, in the Quartz Creek and Tincup mining districts of Gunnison County, has been prepared. This report and the maps

have been placed on file, at the Field Survey Office, 230 U. S. Customhouse, Denver, Colo., and at the U. S. Bureau of Mines office, 515 U. S. Customhouse, Denver, where they may be consulted by those interested in the geology and development of the deposits mentioned.

▶F. C. Blickensderfer has been made mill superintendent of the Molybdenum Corp. of America plant at Urad. This new mill has been built of steel and concrete covered with sheet metal and inclosed in a fabricated insulation material. The initial unit, of 200 tons' capacity, is ready for test runs. Mining operations during mill construction have progressed satisfactorily, and sufficient ore is blocked out to sustain continuous milling operations. The ore is handled through rod mills and separated in flotation units. The initial crushing plant is in the mine workings, and the crushed ore goes down the raise and out the lower tunnel portal to a secondary crushing plant and thence via a 200-ft. conveyor belt to a large cone-shaped steel bin.

▶The Black Bear vein, at the point opened by the Treasury tunnel, being driven by Stiers Construction Co., carries 6 ft. of ore, showing copper, zinc, lead, silver, and gold. The raise into the upper workings will be about 1,100 ft. long and will open up some 400,000 tons of complex sulphide ore that was blocked out when operations were stopped years ago. Sunshine Mining Co., supervising the operations at the Treasury tunnel, is to explore these veins after diamond drilling has determined the character and location of the raise to the Black Bear sixth level.

▶Warren C. Prosser, president and general manager of Mystery Gold Mining Co., is reported planning to resume operations on a small scale at this property, which is near Silverton.

▶George Teal and associates are drifting on the 300-ft. level of the Dorothy mine, and the 200-ft. level is being driven to connect with the 100-ft. level of the Katie workings. Thus the Dorothy shaft will be used for all three operations; that is, the Dorothy, Katie, and Gold Coin. During 1943 Mr. Teal shipped over 100 tons of 45 percent tungsten concentrate and a like amount of 12 percent tungsten ore. E. B. Ralston and H. M. Tenhaeff, leasing from Teal and associates, are drifting from the 125-ft. tunnel of the Crete.

▶Joe Ruth, working the Gold Metal tunnel at Idaho Springs, has cleaned out the caved portion and states that it will require about 60 ft. of cross-cutting to reach the Silver Age orebody. This tunnel, just below Gilson Gulch, is in about 2,200 ft. It contained a number of caved-in sections that were cleaned out in record time. The ore in the Silver Age will be cut at considerable depth.

▶The U. S. Geological Survey and the U. S. Bureau of Mines have been carrying on studies in the Silver Plume section, and have prepared a brief report containing suggestions for prospecting the Silver Plume district. A number of places in the lower workings of some of the larger mines show reason for further prospecting, and the new report emphasizes the structural

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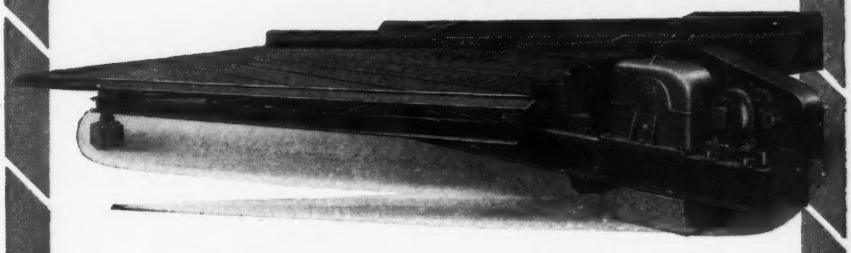

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★ *The ORIGINAL Deister Company • Inc. 1906*

These Alloy Rabble Arms Do Not Grow or Scale; *Blades Are Easy to Replace*

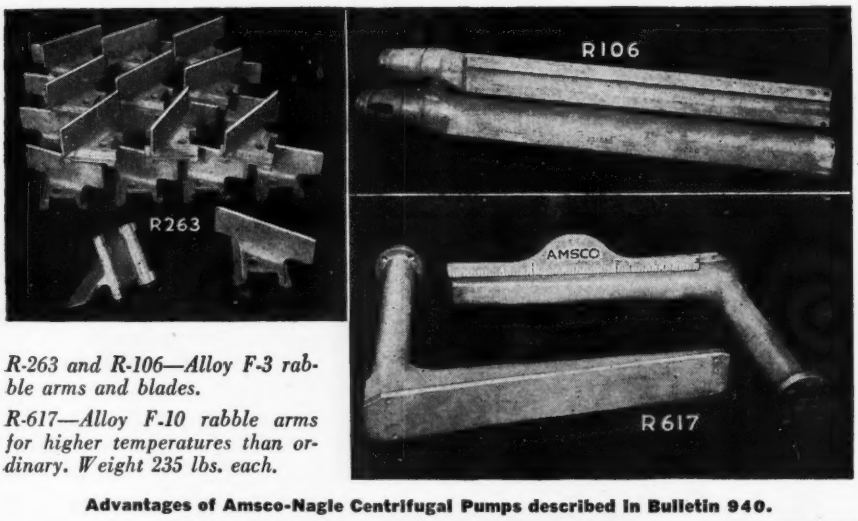
The various processes carried on in modern multiple-hearth roasting, calcining and drying furnaces call for the continuous application of heat and the stirring or "rabbling" of the material. The rabble arms and blades used for the stirring operation are exposed to temperatures which are not excessively high, ranging from 900° to 1800° F., but they are higher than ordinary iron will resist over long periods. Too, corrosion arising from sulphurous gases and severe abrasion have a very destructive effect on anything but a properly selected chromium-nickel alloy.

Amsco Alloy F-3, containing 27 to 29% chromium and 0 to 3% nickel, is almost universally economical in roasting practice. Some rabble arms are cooled by the air which is passed through them, not primarily for cooling purposes but for preheating purposes. It is not necessary to cool Amsco Alloy rabble arms, and the useful service life of non-cooled Amsco arms is no less than that of those which are cooled.

Where temperatures are on the high side and greater strength is required to prevent sagging, arms of Amsco Alloy F-10 (26-28% chromium and 10-12% nickel) are recommended. At a zinc-roasting operation a decided improvement was effected by this change in analysis.

It is seldom reported that an Amsco Alloy rabble arm, blade or tooth has broken in operation; and the service life despite heat, corrosion and abrasion is usually many times that of cast iron. Because this chromium-nickel alloy does not "grow" in service, the rabble blades not only last longer but are easier to replace, cutting down delays and labor costs.

Ask for Bulletin 108.



R-263 and R-106—Alloy F-3 rabble arms and blades.

R-617—Alloy F-10 rabble arms for higher temperatures than ordinary. Weight 235 lbs. each.

Advantages of Amsco-Nagle Centrifugal Pumps described in Bulletin 940.

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OFFICES IN PRINCIPAL CITIES

AMERICAN Brake Shoe COMPANY

Colorado *(continued)*

control of the ore deposits and presents numerous suggestions, based on this control, for further prospecting in the area.

▶ The Franklin mine, on Seaton Mountain, operated by Phil and Arthur Portenier, is shipping to the Ruth mill. This mine is one of the oldest of the Seaton Mountain district above Idaho Springs, but it was inactive for many years, due to the low zinc and lead markets.

▶ P. C. Schreiner, operating the Mile High Mining Co., has added to his working force and is expanding his activities near Georgetown. He is also running the mill and expects to push this to its maximum capacity this spring and summer.

▶ F. J. Parker and associates have purchased a large gold property at Jamestown that includes the King Wilhelm, Badger, and Rip Van Dam claims. This property, noted for its excellent grade of ore, was owned by George Teal, of Boulder.

▶ The Revenue mine, above Ouray, was badly swept in April by a huge snowstorm and slides that took out 65 ft. of the snowshed at the entrance and 85 ft. at the end of the tunnel. This necessitated the digging of a 55-ft. snow tunnel before the portal of the mine could be reached. This work required ten days. The Waterhole slide caused a great blockade and the Switchback and Hayden slides tore out the telephone lines as they ran.

▶ Ralph B. Wright, managing the Colorado Sunrise mine, in Mineral Basin, near Telluride, has a large development program under way. This property, on the east-west Sunrise vein, which cuts the southern extension of the Ajax, contains deposits of zinc-lead-copper ore, but the real production is expected when the north-south vein is cut.

▶ C. E. Fetterhoff is sending about two cars of ore per week to the Huntington mill from the Bald Eagle property, worked through the Two Brothers tunnel and from the East Lake mine, both in Virginia Canyon near Idaho Springs.

▶ Bob McCracken has shipped approximately 50 tons of ore from the New York mine, at Montezuma, to the Resurrection mill, at Leadville.

WASHINGTON

New Metaline district mine in production—Mining group acts to halt claim cancellation

▶ Approximately 75,000 tons of ore has been blocked out at the old Gorrien mine, operated by Sierra Zinc Co., 7 miles southeast of Northport. This property was previously known as the Blackrock operation. The RFC loaned $40,000 for this enterprise and Willow Creek Mines, Inc., added $40,000 more. Two zinc orebodies have been developed to a depth of 200 ft., and diamond drilling below that horizon indicates that the main orebodies continue to depth. A good grade of zinc ore has

been found. The Willow Creek company has released its claim on the property to the Sierra company.

▶Manpower shortage has reduced to three the crew of Red Top Mining Co. near the Canadian border in Stevens County. The company, however, is continuing its development and is sinking an incline winze in a good body of ore about 8 ft. wide that runs 30 percent lead, 20 percent zinc, and 25 oz. silver to the ton. This property is being extensively developed and a mill is planned. S. I. Seigerstad, of Minneapolis, president, is expected to visit the property this summer with perhaps other Minnesota stockholders.

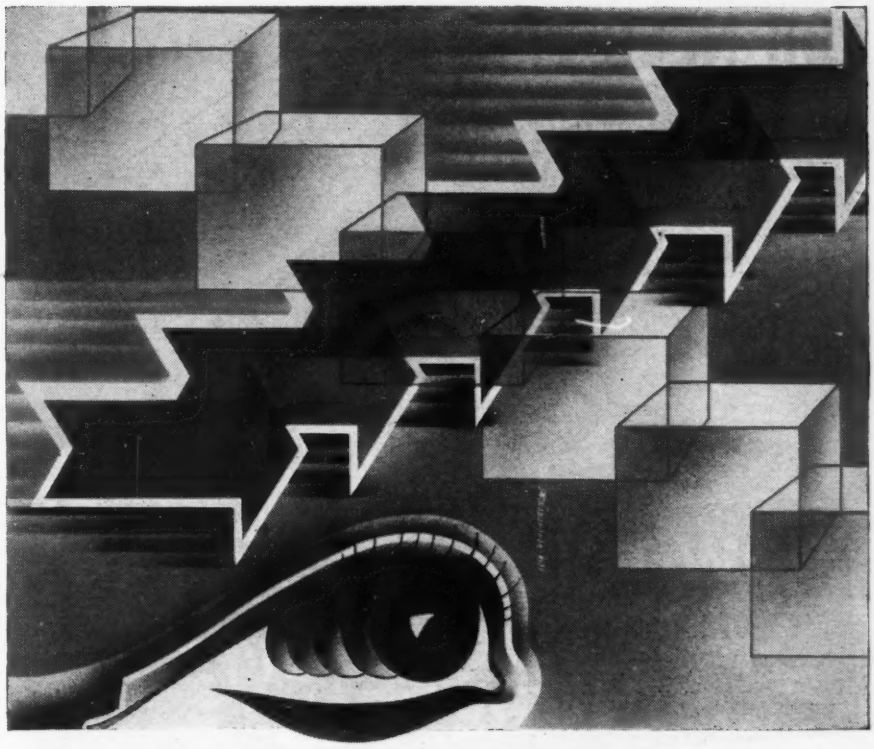
▶Columbia Lead & Zinc Co., which has been developing its property in the Metaline district for about a year, has started shipping zinc concentrates to the mill of Pend Oreille Mines & Metals Co., at Metaline Falls. About 15 tons of ore is going to the mill daily. A mine-to-market road will be built from the property to the county road, enabling the company to increase production. H. S. Johnston, of Seattle and Spokane, is manager.

▶Roy Hoffman, David Soderberg, and U. E. Chamberlain, of Olympia, Wash., owners of the old Frisco-Standard mine, northwest of Metaline Falls, have resumed operations at that property, where a 35-ton mill was installed last year. Some concentrate was produced and shipped to the smelter at Kellogg, Idaho, and this will be continued this year. The owners expect to develop the property this summer, and if values hold up they intend to install a larger mill lower down the hillside where water from creeks will be available the year around.

▶Engineers for the Army, for the U. S. Bureau of Mines, and for the U. S. Geological Survey are at work in the Metaline district. Army engineers are surveying the Z Canyon power site below Metaline Falls and are expected to survey the Box Canyon dam site about the Falls. The Bureau of Mines men and the Geological Survey men are following up the work of aërial photography which was done last fall. They will produce maps showing in detail the physical features of the region. Some of the Army engineers have taken quarters in the 80-unit federal housing at Metaline Falls, which Governor Arthur B. Langlie recently denounced as a "mess" in construction. He said Pend Oreille Mines & Metals Co. offered the government the use of its unfinished hotel building where it could put in 105 apartments at a cost of about $100,000. Instead he said the government spent $300,000 in building 80 housing units which he characterized as a shamble.

▶Judge Ralph Foley of the superior court in Spokane County has sustained the receivership of the Chinto Mining Co., with property near Chewelah. C. I. Miles, owner of 17,000 shares of stock, brought suit to set aside the receivership. The property includes six unpatented and four patented claims and considerable equipment together with buildings and 160 acres of ground.

▶President Charles E. Marr of Northwest



MOVING WITHOUT VISUAL MOTION

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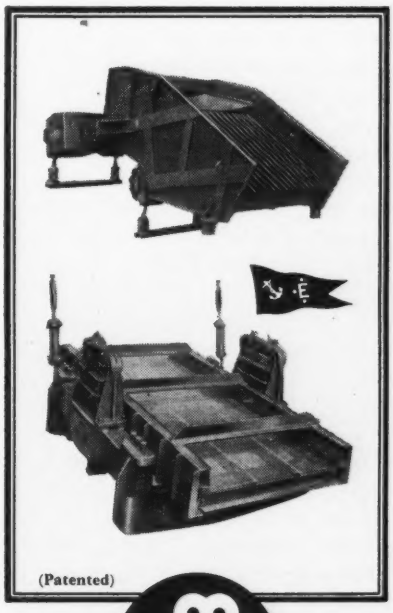

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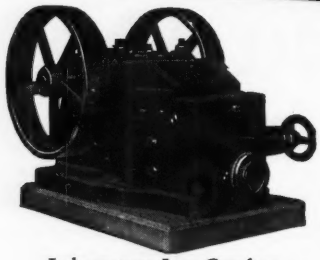
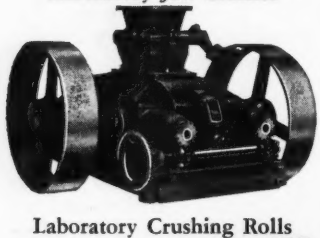
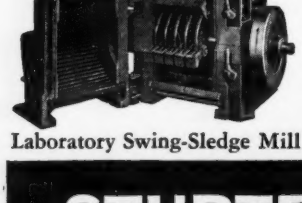


Laboratory Jaw Crusher



Laboratory Crushing Rolls

Laboratory Sample Grinder



Laboratory Swing-Sledge Mill

The results attained in your Laboratory depend as much upon the Laboratory machines as upon the skill of the technicians using them.

Technicians get better results with Sturtevant Laboratory Equipment, not only because of its design, construction and accessibility, but also the resultant quality of output.

The Sturtevant Laboratory Crusher, with its special Roll Jaw action, stands up to its work just as well as a full-size machine, but is capable of a larger range of adjustment for fine, coarse, intermediate crushing.

The Laboratory Crushing Roll is especially designed for Laboratory Sampling work. The range of output for the 8 x 5 size is from ½ in. to 20 mesh and for the 10 x 12 size from ¾ in. to 20 mesh.

The Sturtevant Sample Grinder, of the "Open-Door" disc design, is for products fine as 100 mesh, friable or moderately hard materials . . . coarser mesh on hard rock and ore.

The Sturtevant Swing-Sledge Mill is for coarse or medium reduction. "Open-Door" accessibility. For soft, moderately hard, tough or fibrous products. The leader in its field.

These Sturtevant products are fully described, in detail, in Bulletin 067. It will be sent promptly upon request—a "must" in mines or mills having a Laboratory.

STURTEVANT MILL CO.

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BOSTON 22, MASS.

Washington *(continued)*

Mining Association, at Spokane, says that organization will take steps to stop the wholesale cancellation of unpatented mining claims by the General Land Office. A letter has been received by the Mining Association from Fred W. Johnson, U. S. Land Commissioner, in which he reiterates his position that he has authority to declare null and void mining locations unless the claimants reply within limited periods to adverse proceedings, and submit proof that they have located commercial ore within the limits of each claim. The first case in the Spokane district, where more than 500 such contests are pending, involves three of eight claims originally developed by Gem Mining Co., near Nespelem, Ferry County, Wash.

▶ Wage increases for more than 800 employees in the plant of Aluminum Co. of America, at Mead, have been granted. The increase is from 1c. to 5c. an hour and is retroactive to Jan. 1. Not satisfied with the decision of the WLB, the unions say they will appeal. Arrangements have been made to put at least 30 men to work on part-time jobs at the Trentwood rolling mills. W. N. Farquhar, manager of the Alcoa reduction works at Mead, in addressing Northwest Mining Association, said that if ways are found of removing impurities, alumina produced from Northwest clays may replace bauxite, which now comes chiefly from Arkansas. He described the 135-ft. tanks in which white alumina powder is treated at Mead. The industry, he said, expects to use large quantities of aluminum scrap after the war, but will mix it with virgin aluminum.

MICHIGAN

Reduced mine valuation recommended—New driving record at C.&H. Peninsula mine

▶ A reduction of $207,084 in the assessed valuation of mining properties in Houghton and Keweenaw counties was recommended to the Michigan Tax Commission by Frank G. Pardee, State Appraiser of Mines. The recommended total valuation is $5,884,095, which compares with $6,091,179 in 1943.

▶ The recommended valuation of Houghton County mining properties is $4,504,095, compared with $4,586,179 a year ago. Lower valuations were recommended for all Calumet & Hecla properties in Houghton County except Centennial, recently reopened, which was increased from $50,000 to $75,000, and North Kearsarge, which was raised from $105,000 to $175,000. The recommended valuation of the reclamation properties of Calumet & Hecla was reduced from $1,840,000 to $1,470,000. Partly offsetting these decreases, the properties of Copper Range Co., Champion, Globe, and reclamation, were increased from $850,000 to $885,000; and the new reclamation plant of Quincy Mining Co. was recommended as $250,000. Total recommended valuation of mining

properties in Keweenaw County was $1,380,000 as against $1,505,000 a year ago. The new Iroquois property of Calumet & Hecla was placed in the report at $75,000. Final assessed valuation will be determined by the Tax Commission.

▶ At the Peninsula property of Calumet & Hecla, the 40th level is being driven in No. 4 shaft. A new one-month record of 471 ft. for this branch has been established. Two miners and two trammers on each of three shifts did all the mining, tramming, and delivery of rock into the skips. They were assisted by extra men in laying track and moving the scraper engine. The record of 2.91 ft. advance per each miner's shift is also a new high.

▶ The new Allouez shaft of Calumet & Hecla is bottomed at 692 ft. and work has been started on the second level. The first level was put in at 440 ft., where the conglomerate bed was drifted on for a distance of 575 ft. and the north drift hit the top of the lode. Over 1,900 ft. of drifting has been completed in a series of amygdaloid veins that developed in the hanging wall.

▶ The plat on the 18th level of the Iroquois shaft of Calumet & Hecla has been completed and the station opened. Drifting has reached 800 ft. on that level. The drift on the 10th level has reached a point 2,600 ft. from the shaft on the north side, and on the 6th level a 3,800-ft. drift has been driven on the north side of the shaft. Exploratory work has been started in a hanging vein on the 6th level. Chutes are being cut to provide for stoping.

▶ Clad-steel scrap is being treated at the Lake Linden leaching plant and still house of Calumet & Hecla. In one month's operations, 3,264 tons was treated to produce 1,174,831 lb. of copper. This copper and the clean steel scrap are returned to the government for use in constructing war materials.

ARKANSAS

Floods hamper production in Batesville field—New mill going up at Hurricane mine

▶ The Batesville-Cushman manganese field suffered a setback in April and early May, caused by heavy rains which flooded numerous shafts and tunnels. It was the worst month the field has gone through during the last year, but production was good despite the handicaps, and as soon as the weather settles there should be a gain in output. Total production for April ran to 1,613 tons, of which 599 tons was high grade and 1,014 tons low grade. Two new washing and concentrating plants will be in production within the next 30 days.

▶ Walter H. Denison Manganese Co., of Cushman, led the field in April. Its entire production came from properties in the Pfeifer area, and totaled 623 tons, 221 tons of which was high grade and 402 tons low grade.

▶ Lou Peterson, of Cushman, operating on the Turner property near Cushman, will

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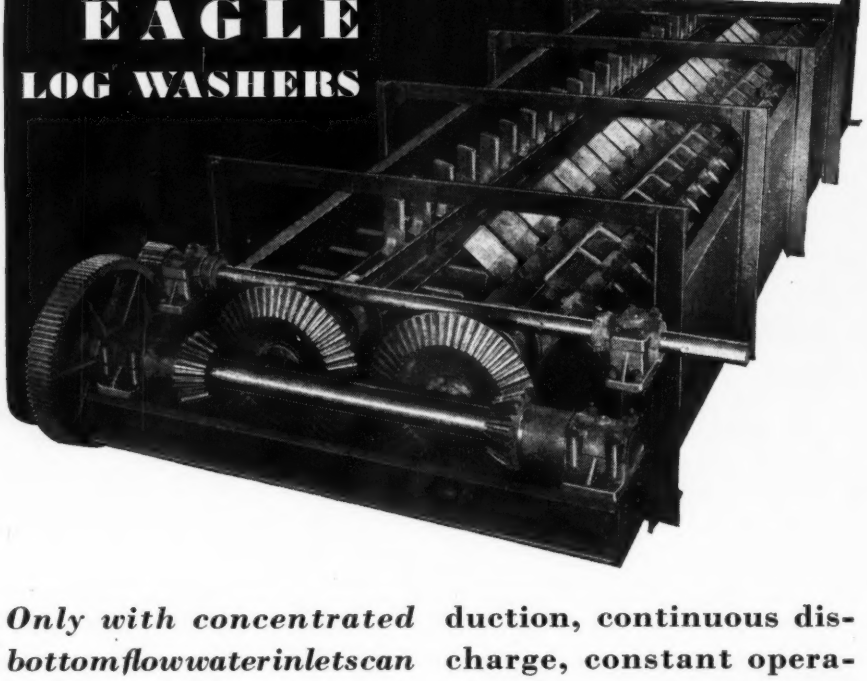

Only with concentrated bottom flow water inlets can you get intimate, thorough washing and separation of ores that are combined with cemented gravel and clay. This design feature of Eagle Log Washers and Screw Washers plus many other operating advantages including high production, continuous discharge, constant operation, fine or coarse overflow control and uniformity of product are the reasons why these units are preferred by experienced mining engineers everywhere.

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Arkansas *(continued)*

have his new washing and concentrating plant in operation in about 30 days. Recent checks on crude ore on the property, for washing and concentrating, show a big tonnage. His new plant will handle about 80 tons of crude a day.

▶ Charles Sims, of Cushman, operating on the Einstein, Gray Hill, and Tate properties, is getting good production from three new shafts on the last-named plant. They run from 45 to 60 ft. deep and are producing low grade. Mr. Sims' production for April ran to 140 tons, of which 40 tons was high grade.

▶ Stanley Bourne and Ernest Stroud, of Batesville, who operate the Austin mine, near Mt. Pleasant, in Izard County, have been closed down for several weeks on account of bad weather and lack of equipment. They expect to install a power shovel and dragline in the near future and do pit mining.

▶ Arkansas Manganese Co., of Cushman, headed by Jack Gibbons, was slowed down by wet weather in April and early May. Several shafts were flooded, but no serious loss has resulted. Their total production for April ran to 351 tons, 135 tons of which was high grade.

▶ Marshall McGee and Preston Grace, operating the Chin property, in the Cave Creek area, lost a lot of tonnage in April on account of rains and floods. Their main producing tunnel was flooded, and they cannot start operations in it until it drains out. Preston Grace has been called for service in the Navy, and Mr. McGee has to handle all operations on the property. Their production in April ran to 75 tons.

▶ Hendricks Mining & Milling Co., of Batesville, Alvin Hendricks, general manager, produced 350 tons in April, of which 150 tons was high grade, 50 tons medium, and 150 tons low grade. The company's crude ore is clay in which high-grade manganese ore is disseminated, mostly in small pieces and fines, and when it gets thoroughly water soaked it is hard to handle. All pit mining at this time is done with power shovels and a dragline. To increase mill production the company is installing another set of log washers, which will probably be in operation soon.

▶ C. S. Little, of Batesville, operating on the Gray Hill property, produced 75 tons in April. Two new shafts are in ore and a third is nearing the ore zone.

▶ The Norfork Dam, on the Northfork River, near Mountain Home, in Baxter County, is nearing completion, and power from this dam will play an important part in the development of the mineral resources in the White River Valley after the war. It is one of the six largest concrete dams in the United States, and will produce 120,000 kw. when all of the generators are installed. Power from the dam during the war will go to war plants. It lies in the North Arkansas zinc and lead field, about 60 miles northwest of the Batesville-Cushman manganese field.

▶ S. & G. Zinc Incorporated, J. C. Shepherd, of Harrison, in charge of operations, has been hampered by bad weather in the

construction of a new mill at the Hurricane mine, in Searcy County. It probably will not be in operation until the last of June or later. When completed it will be the best milling and concentrating plant ever built in the zinc-lead field. It will handle approximately 30 tons of crude an hour. The equipment will consist of washing screens, to eliminate the clay; a crusher, two sets of rolls, rougher and cleaner jigs, and four tables to take care of the fines. The plant will be powered with two 100-hp. diesel engines. The water line has already been laid to furnish water for plant use. J. D. Marsh has been employed as superintendent.

▶The Bureau of Mines has completed its last exploratory churn drill hole in the zinc district, in Boone County. No information has been released on whether or not they will do any more exploratory work in the field.

▶Hall Mountain Mining Co., operations in charge of J. C. Jones, of Yellville, has encountered a good run of marionite in its Wickersham tunnel, on which it has been operating for the last six weeks. It is a high-grade zinc carbonate running slightly over 45 percent. Operations have been hampered during the last few weeks by lack of labor. They will construct a milling plant on the property if they can get labor and material.

▶Moark Mining Co., C. T. Rabineau, of Zinc, in charge of operations, has opened up several new tunnels and has encountered some good runs of silicate. They keep their little milling plant in operation and will produce their usual monthly car of ore in May.

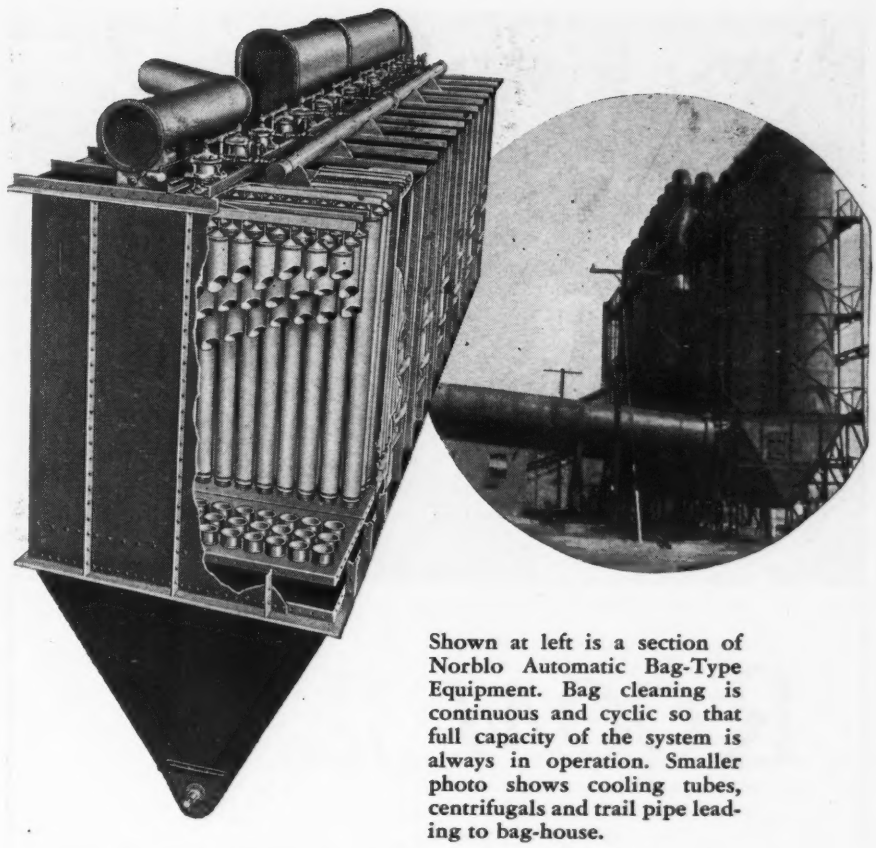
▶Advance Mining & Engineering Co., John Stone, of Harrison, in charge of operations, has a new dry process milling plant nearly completed. They are operating the old North Star property near Harrison.

NEVADA

A. S. & R. develops old Delno mine—Manganese Ore Co. plant is reported in better condition

▶Preparing to ship 1,000 tons of lead-silver ore monthly to its Murray smelter in Utah, American Smelting & Refining Co. is developing the old Cleveland mine, in the Delno district, eastern Elko County, under direction of J. Fred Johnson, manager of the Western mines division, with S. E. Zelenkoff, superintendent. The post-office is at Montello. Shipping-grade ore is being blocked on the 240- and 380-ft. levels of a vertical shaft, sunk by contract. On the adjoining Panther mine the early-day Delno company sank a shaft 1,700 ft. deep, and it was indicated the new Cleveland shaft may continue to that depth.

▶Mines of Tonopah Mining Co. of Nevada, at Tonopah, in 1943 produced 5,070 tons of ore, shipped by lessees to smelters in Utah, a drop from 8,743 tons shipped in 1942. Average content was 0.33 oz.



Shown at left is a section of Norblo Automatic Bag-Type Equipment. Bag cleaning is continuous and cyclic so that full capacity of the system is always in operation. Smaller photo shows cooling tubes, centrifugals and trail pipe leading to bag-house.

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The performance of Norblo equipment in war production has provided data and standards which, henceforth, must be reckoned with in post-war investment in dust collection systems. Norblo engineered performance is guaranteed on a basis that makes possible accurate, dependable costs and intelligent profitable investment. It also makes possible comparison of alternative systems.

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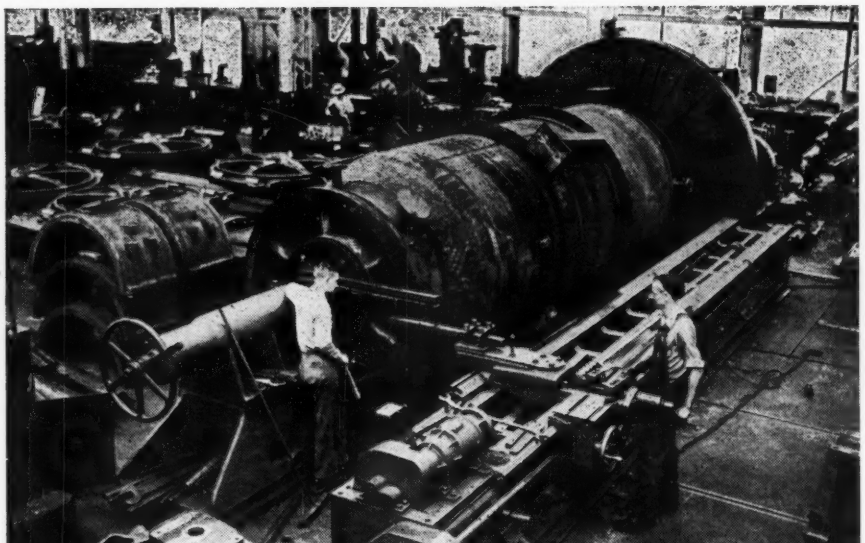

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But please do not measure Stearns-Rogers' ability to serve the mining industry by size alone. We recognize a big responsibility to you, and will make every effort to solve your problems with every resource at our command—whether your 'headache' is a giant machine or a small part that stands between you and uninterrupted production.

Stearns-Roger

THE STEARNS-ROGER MFG. CO. DENVER COLORADO

Engineers *Designers*
Contractors *Manufacturers*

Nevada *(continued)*

gold and 31 oz. silver per ton. Net operating profit at Tonopah was $2,423.82, against $16,523.59 in the previous year. Horace A. Johnson is in charge at Tonopah. The controlled Jim Butler, Vertex, and Tonopah Nicaragua properties remained closed during the year. La Luz Mines, Ltd., in Nicaragua, one-third owned by Tonopah Mining, maintained operation on the reduced basis of 1,000 tons per day and made satisfactory profit. Cash on hand at year's end was $27,019.52 and current assets were $846,069.19, including marketable securities having a cost price of $1,198,746.59 and current market value of $811,769.58. Thayer Lindsley, of Toronto, is president of the company.

► The 1,000-ton manganese ore leaching plant of Manganese Ore Co., subsidiary of M. A. Hanna Co., of Cleveland, has been reported as achieving within the past few weeks an ever-increasing production record. The plant, which uses a process involving leaching with sulphurous acid, counter-current washing, evaporation, and roasting to produce high grade manganese sinter, has never exceeded one-third capacity, but the chief difficulties have thus far been mechanical and have largely been overcome. Chemical problems are also reported solved. H. L. Hazen, metallurgical engineer, is now in charge of operations at Boulder City.

► Construction of a 300-ton tungsten concentrator is in progress at the central property of the Nevada-Massachusetts Co. near Mill City, Pershing County, to replace the 260-ton plant destroyed by fire in November. Ott F. Heizer, manager, expects to have the new plant in operation late this spring. The company continues to operate its 1,000-ton tailing plant as well as smaller concentrators of its two affiliates, Rare Metals Corp. and Golconda division, in Humboldt County.

► A plant of substantial capacity is under construction by Fluftrok Corp. near Mason, Lyon County, for the manufacture of wallboard, lath, and insulating aggregate. Raw material is to be trucked from deposits on Bodie Creek in western Mineral County. Ground to ⅛-in. for aggregate and 100 mesh for wallboard, the material explodes under heat to 20 or 30 times raw volume. Unlike perlite, used for this purpose, the rock has a straight grain, resembling low-grade asbestos. Perry G. Means, of Reno, is head of the company.

► International Mining Corp., New York, reports having closed down late last year the Groom lead mine and 50-ton flotation mill, 91 miles west of Caliente, nearest rail point, in western Lincoln County. The project, starting production in May, 1942, is two-thirds owned by International and one-third by Dan Sheahan, engineer in charge. The production is a clean galena, shipments having been made as early as the '60s. Diamond drilling will be started shortly. The operation in 1943 showed a loss of $4,753, but the shutdown resulted from inability to obtain workers and the reserve is substantial.

► Heavy loss was sustained in the burning recently of a warehouse at the lead-zinc-

silver mine of Prince Consolidated Mining Co. near Pioche. Valuable records were destroyed, together with most of the material in storage. D. I. Gemmill is manager.

▶ Production of lead-silver ore by Bristol Silver Mines Co. in the Bristol district, Lincoln County, is to be increased with completion of a new access road now under way. Ore has been transported over a 9,000-ft. aërial tram to bins at the narrow-gage railroad and reloaded to standard-gage cars near Pioche for delivery to the International smelter at Tooele, Utah. J. H. Buehler, of Pioche, is general manager.

▶ Trucks are delivering around 200 tons of surface ore per day from the Ophir mine, on the Comstock lode, to the 400-ton cyanide mill of Consolidated Chollar, Gould & Savage Mining Co. below Gold Hill, a two-mile haul, for the lately organized Virginia City Mining Co., which has leased the mill to conduct bulk sampling of the north-end group of mines of the Consolidated Virginia Mining Co. Power shovels have completed stripping a considerable area on the Ophir for open-cut mining. Guy M. Standifer, of San Francisco, is president of the Virginia City Mining Co. and Clyde E. Collins is superintendent.

▶ New mine access roads having a length of 82.4 miles had been completed in Nevada as of May 1 at a cost of $135,650, and four others with total of 83.15 miles, costing $125,875, were nearing completion. Mines to which roads were not yet completed were in the Ivanhoe district, Elko County; Antelope and Superior, Pershing County; Cleveland mine of A.S.&R. Co., at Delno, Elko County; and Bristol Silver, in Lincoln County.

▶ Members of the Nevada section of the A.I.M.E. were guests on May 17 and 18 of the newly organized Clark County subsection when more than 200 attended a dinner and business sessions at Henderson, the Basic Magnesium, Inc., town. Guests included Chester A. Fulton, national president; and A. B. Parsons, secretary of the Institute. Robert S. Moehlman, chairman of the Nevada section and Western exploratory geologist for Anaconda Copper Mining Co., presided. Others who addressed the members included F. O. Case, manager for B.M.I.; Senator James G. Scrugham, of Nevada; Jay A. Carpenter, secretary-treasurer of the Nevada section and director of the State Bureau of Mines.

Henderson Reveals Tin Smelter Production

Production at the Longhorn tin smelter, in Texas, has reached a total of over 41,000 tons of the metal since operations began in April, 1942, according to information contained in a recent radio address by Charles B. Henderson, chairman of the RFC. He added that the $6,000,000 plant is now producing at a rate of about 2,500 tons of tin per month. The smelter is now treating a part, rumored to be about half, of the Patiño output of tin concentrate that formerly went entirely to British smelters.

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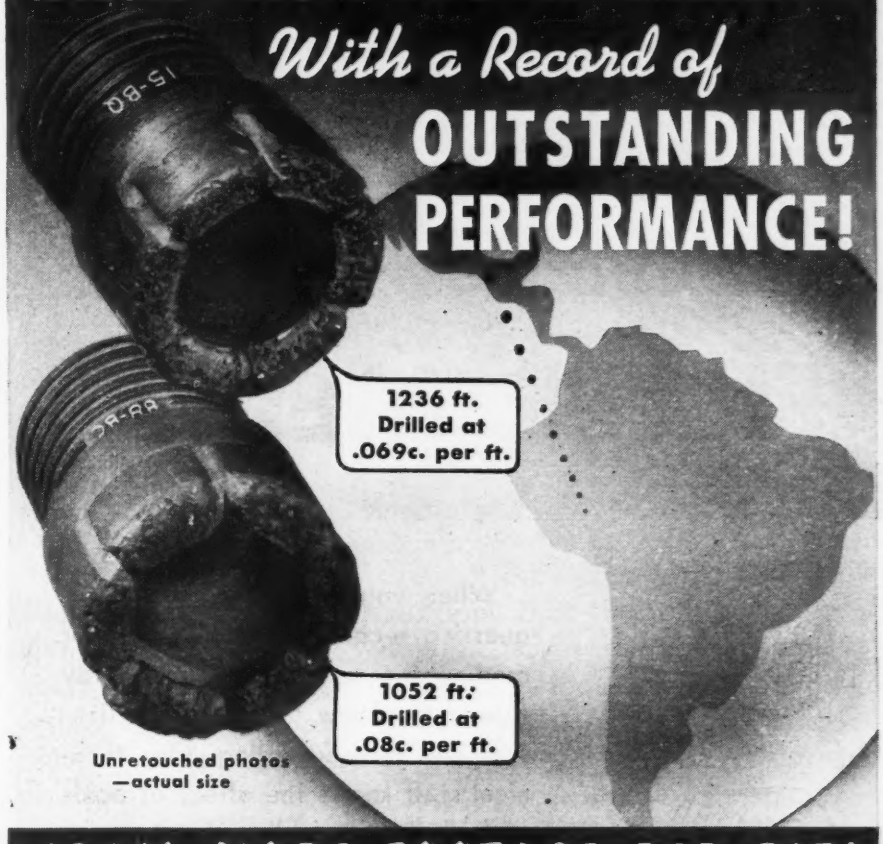

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SIZES	START	FINISH	TOTAL WEAR
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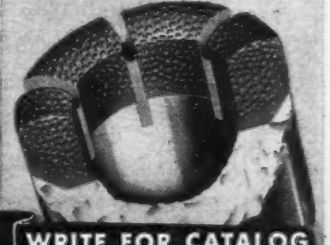
I.D.	.837	.861	.024
Length	1.895	1.740	.155

Bit No. 15-BQ—Size EX

SIZES	START	FINISH	TOTAL WEAR
O.D.	1.460	1.420	.040
I.D.	.835	.875	.060
Length	1.910	1.700	.210

CUT-AWAY SECTION OF NEW EX BIT SHOWING ORIGINAL MATRIX SIZE



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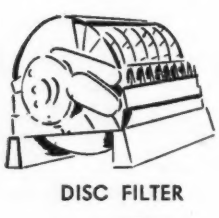
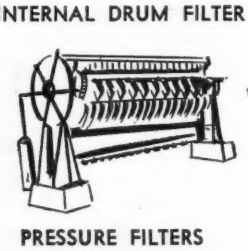
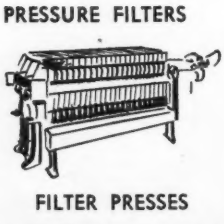


DISC FILTER

INTERNAL DRUM FILTER



PRESSURE FILTERS



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TRI-STATE

Eagle-Picher closes three mines and Bird Dog mill for lack of manpower

▶ Development of an acute labor shortage in the Tri-State district during May was marked by the closing of three major mines and the Bird Dog central mill by Eagle-Picher Mining & Smelting Co., the leading producer of zinc and lead concentrate in the area. Crews from the affected properties, including the Grace Walker Nos. 1 and 2 mines southeast of Picher and the Gordon No. 2 mine northwest of Picher, were shifted to other company operations to fill gaps left by the heavy inroads of the draft in recent weeks. The Bird Dog mill, one of the few large central concentration plants in the mining field, is two miles west of Picher.

▶ In addition to the necessity of closing its mining and milling properties, the company has been forced to reduce production about one-half, due to a shortage of labor at its Galena smelter. The shortage amounts to about one-third the normal complement of 300 men employed at the plant. As about one-third the normal crew are maintenance, the shortage of a third of total men employed has resulted not only in forcing some departments to shut down outright, but also of cutting in half the output of other units still able to operate.

▶ A few weeks earlier, Kansas Explorations, Inc., also reported that, because of the labor shortage, it was forced to close its Buckingham No. 2 mine, north of Oronogo, and shift the depleted crew to other company operations. Subsequently, Ross Blake, of Joplin, district manager of Kansas Explorations, reported the closing of the company's Lotson mine, southwest of Cardin, because of the labor shortage. Many other companies operating throughout the local mining field are confronted with the same problem.

▶ Eagle-Picher representatives pointed out that the shutdowns are only the beginning, as the present rate of inductions continues to cut deeper into the ranks of the available labor supply of the district. They also pointed out that many of those called who are disqualified for the armed forces because of physical reasons fail to return to employment in the mines.

▶ It was also reported that government employment agencies in the district have been unable to supply men for the mines, and, although during the last two years the district has been designated at times by these federal agencies as a surplus labor area, there have been but brief periods when Tri-State mines were not short by as much as 2,000 men of normal operating crews. These local agencies report good co-operation on the part of the companies, but their recruitment of labor for the mines has not met the demands. At present they are making every effort to keep miners at work in the district, but permitting a certain amount of shifting from one mine to another and mak-

ing changes in job classifications here and there to hold the men in the district.

▶ As those interested, or closely associated, in the zinc industry know, domestic producers have done a magnificent job in the production of the metal to the extent that its present supply is no longer critical, but is regarded as sufficient to meet war demands. However, government officials continue to pay premium prices, probably believing that much more zinc will be needed after invasion starts. With this forethought in meeting any unforeseen contingencies that might arise toward the successful prosecution of the war, measures undoubtedly will be taken also to assure an adequate supply of manpower necessary to maintain mine production for final victory.

▶ In conclusion, it might be well to point out that in the face of the uncertainties of war, upon the progress of which the fate of the premium system depends and the labor situation hinges, there is little encouragement for the Tri-State operators to do much prospecting or development. Consequently, such activities practically are at a standstill in the district.

IRON COUNTRY

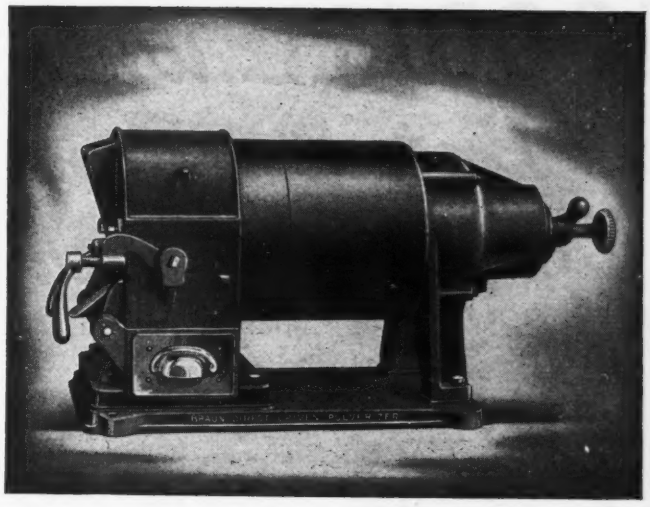
Republic Steel improves its Penokee group—Upper Michigan tax study group formed

▶ Pickands, Mather & Co. has discontinued for the time being its underground diamond drilling at the Ironton-Puritan mine working near Bessemer, Mich., on the Gogebic Range. In 1942 the company started dewatering the idle Ironton and Puritan mines, and exploration for new orebodies followed. Each of these mines started shipping ore in 1886, but ran out of commercial iron ore about 1940.

▶ The latest developments of the Centennial Committee to commemorate the discovery of iron ore on the Marquette Range at Negaunee, Mich., is a pageant to be held July 4, for which invitations have been extended. This event will be held from June 1 to Oct. 1, and exhibits will be on display for the four months.

▶ On May 1, representatives of political divisions from the Gogebic, Menominee, and Marquette iron ranges met at Negaunee, Mich., and formed the Upper Peninsula Iron Range Tax Study Association, which will compile data and other material on mine valuations and make a united presentation before the State Tax Commission when it holds its hearings in 1945. William Johnson, city manager of Ironwood, was elected chairman; H. J. Adams, Ishpeming, vice chairman, and James Trebilcock, Wakefield, Mich., secretary.

▶ The Cary mine borehole joined on May 12, at a depth of 2,500 ft., a raise driven up to meet it from the 31st level of the mine. The 5½-ft. bore will now be stripped down to form a new hoisting shaft. J. B. Newsom planned and started the work for Pickands, Mather & Co., and Warren Lyons finished the job.



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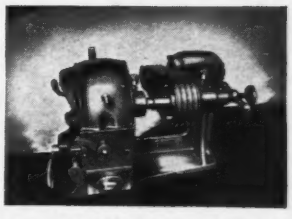

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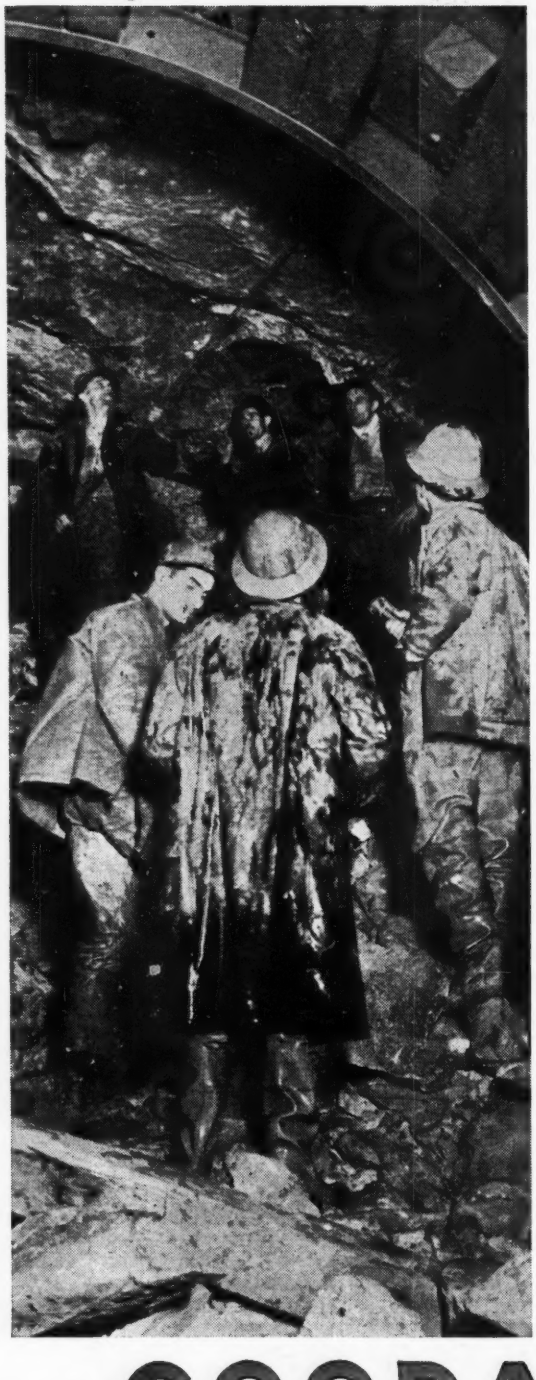

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Iron Country *(continued)*

▶ Mineral Mining Co. is diamond drilling on surface at the Breen iron mine, which has been idle since 1906. It was the first mine to ship from the Menominee iron range in 1877. The mine is at Waucedah, Mich.

▶ North Range Mining Co. announces that it will soon begin sinking the main shaft of the Blueberry iron mine an additional 200 ft. to the 16th level. The mine is six miles west of Ishpeming, Mich., on the Marquette Range, and began shipping iron ore in 1920.

▶ Important improvements are being made both on surface and underground by Republic Steel Co. at its Penokee Ore Co. group of mines at Ironwood, Mich. This company took over the Aurora, Norrie, and Pabst mines from Oliver Iron Mining Co. in 1936. Underground, the Norrie incline shaft has been deepened 420 ft. to the 29th level, and a new drift has been extended from the bottom to reach the Pabst orebody. When new equipment is operating, this ore will be hoisted through the Norrie shaft. On this new level the haulage gage will be 30 in. instead of 24 in., now used on the old levels, and 100-cu.ft. capacity low-head side-dump cars will replace the smaller type now operating. On surface at the Norrie shaft the engine house is being enlarged to fit the new hoist equipment needed for the greater depth. This company now employs about 360 men on three 8-hr. shifts per day. A. J. Christianson is superintendent.

▶ The Michigan State Tax Commission moved the hearing place back from Marquette to Ishpeming, where the hearing was held on May 8. L. S. Nems, R. H. Marsh, and Clarence La Chance, the three members of the commission, were present, and Mr. Nems presided at the public meeting, where F. G. Pardee, appraiser of mines, read the list of tentative valuation of each mine on the Marquette Range for the present year. Only one request was made for reduced values. R. L. Wahl, general superintendent of mines for Inland Steel Co., based his plea on the fact that at the company's Morris mine it was necessary to pump 32 tons of water for every ton of ore produced. C. J. Stakel, general manager of mines for Cleveland-Cliffs Iron Co., appeared before the commission and outlined the condition of his company's mines on the Marquette range, detailing competition Michigan ores in the near future can expect from other states as well as from South America. With taxes too high, he said, they will be barred from the ore markets of the world.

▶ On April 29 several mining and business executives interested in the Steep Rock Mining Co. iron ore deposits in Ontario visited the new Mather mine, at Ishpeming, Mich. In the group were General D. M. Hogarth and Col. G. G. Blackstock, both of Toronto and directors of Steep Rock Co.; Cyrus S. Eaton, director of Steep Rock, and Max H. Barber, vice president of Cleveland-Cliffs Iron Co., both of Cleveland, Ohio. Also Hugh M. Roberts and William H. Crago, engineers from Duluth, Minn., for the Steep Rock Co.

They left next day for Duluth on their way to inspect the Steep Rock property. The iron ore to be produced at Steep Rock mines is to be marketed by Cleveland-Cliffs Iron Co. It is planned to produce 500,000 tons this year, but in the future the annual tonnage will be about 2,000,000.

ALASKA

Alaska Juneau miners find work elsewhere — Sleetmute mercury mine is closed down

▶Norman Stines, mining engineer, who deals extensively in mine equipment, told the Alaska Miners' Association, at Fairbanks, that supplies usually are granted, after clearance from the War Manpower Commission, if the proper procedure is followed. He advised the Association, however, to get straightened out first with the WMC. He said operations exceeding a minimum of 200 tons or 200 cu.yd. usually brought priorities automatically. He said no new equipment could be had, but there is no limit on the amount of used equipment which can be employed. Of controlled materials the operator is entitled up to 120 percent of the amount used in 1943. A priority of AA-5 is obtainable without the need of serial numbers. He indicated that though certain munitions production has been reduced, the time when regular mining can be done will depend on the invasion. Of minerals produced in Alaska, tin is the only one in which there is a shortage.

▶The United States Employment Service office at Juneau reports that miners who were with Alaska Juneau before it closed down are finding positions. Of 184 who had left Juneau early in May, 144 had found new places and 60 had obtained local jobs. Forty-two were placed in Skagway. Attempts were made to send men from Juneau to the Coeur d'Alene district, in Idaho, but they were largely unsuccessful.

▶Decoursey Mountain Mining Co., which is producing mercury from its property, at Flat, is shipping its product to the Department of Mines at Anchorage. It has become a steady producer.

▶Lieutenant W. T. Ferran, of the U. S. Navy, who with three other officers has been making a preliminary survey of the oil resources in the Naval Reserve in the Arctic region of Alaska, has gone to Washington, D. C., to make his report. He says he or someone else will be sent to Alaska to continue this work. It is believed in Alaska that these naval investigations are the result of criticism of the development of foreign oil fields by the United States when large supplies in Alaska remain untouched.

▶B. D. Stewart, Commissioner of Mines in Alaska, has been authorized to provide operators of small lode gold mines additional relief similar to what has been given placer miners. Permits may now be issued by the Commissioner of Mines for as many

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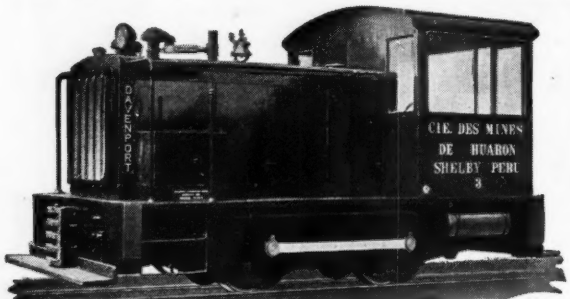

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Alaska *(continued)*

as seven men for each lode-gold operation. Permits will be valid for indefinite periods unless canceled for cause.

▶ White and Chappell are said to be the only men who operated on Noland Creek last winter. Vernon Watts, who has mined in the Hammond Creek district for 40 years, spent last winter in Fairbanks.

▶ Men from Goodnews Bay Mining Co. who went to the States last fall have returned to their jobs at Platinum. About 25 men came back in April.

▶ The Territorial Department of Mines announces that the strategic mineral prices of Metals Reserve Co. in Alaska will be guaranteed until Dec. 31, 1944.

▶ The U. S. Geological Survey has made a preliminary report on deposits of asbestos on Dahl Creek, in the Kobuk River district. The department has also made reports and maps of chromite on Baranof Island, nickel deposits at Silver Bay, and a chromite body at Red Bluff Bay. According to the report, no chromite occurrences of economic importance were found and the nickel deposit was very small.

▶ The mercury mine at Sleetmute, run by New Idria Quicksilver Mining Co. of California, has ceased operations because of expected cancellation of contracts with Metals Reserve Co., according to Harold Schmidt, executive. Twenty-five men were employed during the winter. He says his company would rather produce at the old price of $70 if conditions were normal.

CANADA

Base-metal contracts with Britain renewed — Manpower shortage worse—Prospectors active

▶ Contracts between Canadian producers of lead and zinc and the British government have been renewed for a year beginning Sept. 1. No changes have been made in prices or other terms, although all contracts are subject to termination, if the war should end, upon three months' notice. At the same time it was announced that copper contracts with Britain would be extended from Sept. 1 through Dec. 31, 1944.

▶ The Department of Munitions and Supply announced recently that four zinc-lead properties, operating in Canada for Metals Reserve Co., will close down to release labor and materials for more urgent needs. These properties are: Twin "J" Mines, Duncan, B. C.; Kootenay-Florence Mine, Ainsworth, B. C.; Lake Geneva Mine, Benny Siding, Ont.; and Tetreault Mines, Notre Dame des Anges, Quebec. They have all been referred to as high-cost producers. In addition, it has been reported, without confirmation, that two high-cost Canadian copper producers were also handed contract cancellations on May 15, but that arrangements have been made to continue operations "for the present" without benefit of a bonus.

▶The manpower situation in Canada's mines is rapidly worsening as summer approaches and colonists and farm workers return to farms. Production at nearly all mines, both base metal and gold producers, has fallen off. National Selective Service is attempting to alleviate the trouble by redirecting men from marginal mines to those possessing better production possibilities. For example, from the four closed zinc mines mentioned previously, men are to be redistributed as follows: About 200 British Columbia men to go to C.M.&S. Co., the Tetreault men to New Aldermac, the Lake Geneva men to Sudbury. Outcome of this program will be watched with great interest.

▶Exploratory work, including diamond drilling, is proceeding at a greater rate and over a wider area than in any other season on record. Field parties representing many of the major companies, as well as individual grub-staked prospectors, are operating within the mapped areas of northern Quebec and Ontario, in northern Manitoba, in Labrador, and through the territory tributary to the Alaskan Highway. Some of this exploration work is detailed as follows:

A major prospecting campaign has been laid out by Labrador Mining & Exploration Co. for its large concession in Labrador and westward into New Quebec.

American Metal Co. of Canada, subsidiary of the U. S. company of the similar name, has flown four parties up into the Coppermine River country, in the Northwest Territories, to spend the summer examining copper claims that were staked last year. Three diamond drills and crews will go in as soon as work becomes possible. Morton Graddis will direct the work.

The *Northern Miner* reports a "big scramble" for claims along the two main gold belts of Ontario and Quebec, with the principal activity centering along the northern belt east of Porcupine clear into Ontario.

The success of Giant Yellowknife in hitting good ore has increased activity in this region.

Hudson Bay Mining & Smelting Co., Ltd., has sent a party into the Atlin Lake country again this year.

Consolidated Mining & Smelting, Leta Explorations, Ltd., St. Eugene Mining Corp. Ltd., Frobisher Exploration Co., Ltd., and Kelowna Exploration Co., Ltd., are among those now prospecting in British Columbia, the Yukon, and the Northwest Territories.

A syndicate of business men of Whitehorse, Y. T., is prospecting along the Alaska Highway and the Canol pipeline. Experienced men, obtained through the cooperative services of the British Columbia and Yukon Chamber of Mines, have been grubstaked for the season.

ONTARIO

▶Tax recommendations of the Ontario Mining Commission have been incorporated in a formal request made by the Ontario government to the federal government. The Commission's recommendations included suggestions that depletion allowance on mine earnings and dividends

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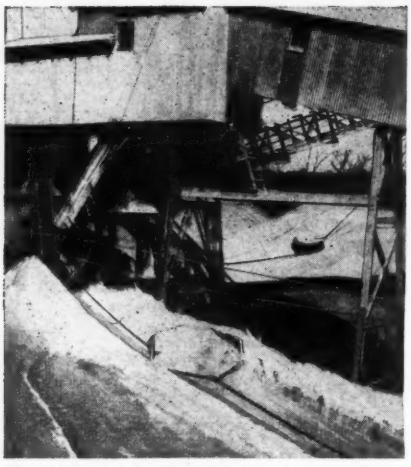

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EXPLANATION OF PICTURE—

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The scraper in the foreground of the picture is stocking out screenings that are spouted onto the ground from the conveyor. This product is sold to the fertilizer trade with demand coming mainly in the Spring months. Upwards of 25,000 tons accumulates between seasons. The scraper piles up this surplus during nine months of the year and then works overtime in the Spring to reclaim the stored material.

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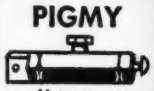

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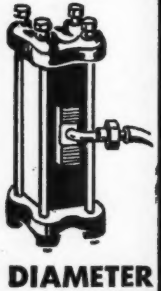

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Canada *(continued)*

be increased to 50 percent and that provincial taxation be calculated before federal income taxes. The provincial government feels that such provisions are necessary to provide additional revenue for Ontario's mining towns, which need it badly, and to assist the progress of mining after the war.

▶ New labor legislation has been adopted by both the Ontario and the Dominion governments, placing full responsibility upon the Ontario Labor Relations Board for settlement of labor disputes of all industry in Ontario. Cases recently referred to the Board from the Ontario Labor Court involve applications for certification as bargaining agent at four Kirkland Lake Gold mines on the part of the MMSW. Until a similar provincial body is appointed, Quebec labor disputes will be heard before the National Labor Relations Board at Ottawa.

▶ In the annual report of Ventures, Ltd., it was reported that the company's subsidiary, Dominion Magnesium, Ltd., near Renfrew, Ont., was making magnesium for less than 22c. per pound. Production at this plant is between 10 and 15 tons of magnesium daily.

▶ Steep Rock Iron Mines reports progress according to schedule in preparing for initial production in August. Diversion of water through the Raft Lake cut has been completed, except for installing control works at the spillway, and water is flowing through the Esker cut and tunnel. The cofferdam at the narrows has been completed. With the lowering of the lake level on May 6 to 75.5 ft., a reef was exposed projecting out from Mosher Point, making it necessary to move two of the pump barges into Power House Bay. One of these is to be used later in hydraulicking the material overlying the orebody. A large area of lake bottom has been exposed at the lower end of Steep Rock Lake. What has been described as the longest span of high-tension line in Canada has been formed by wires strung across the bay from the Mosher Point transformer station to the main power line. Progress is being made laying foundations for the crushing and screening plant, and road construction is in progress from this plant across the lake bed toward the orebody in preparation for mining. Shipments this year are expected to be through Duluth, rather than Port Arthur, if construction of the ore dock is not completed for the 1944 season. Good progress is reported in running the spur line to the property from the railroad at Atikokan.

▶ No decision has yet been reached by the Ontario Government concerning payment of a bounty on iron ore. It was stated at the annual meeting of Sherritt Gordon Mines, which controls extensive iron deposits in the Michipicoten district, that the Josephine mine could now be in production if negotiations had been settled. The bounty on Josephine ore, which runs better than 60 percent iron, would amount to about $1.20 a ton. Reserves at the property have been extended another 600,000 tons and diamond drilling and

development are continuing below the 6th level, where a continuous ore length of 1,500 ft. has been exposed and a 1,200-ft. extension indicated. The general manager, E. L. Brown, reports this property indicates that: "we have an excellent chance of developing an operation very much more important than the Sherritt Gordon ever was." On the adjoining siderite orebody ore reserves amount to 28,000,000 tons to a depth of 900 ft., with a good possibility for doubling this tonnage. There was stated to be a market for siderite, after sintering, in the United States.

MANITOBA

▶ Production at the Sherritt Gordon mine is expected to be maintained until 1949 on the condition that present prices and costs are maintained. Ore reserves of the East mine it is estimated will be exhausted late in 1945. Thereafter the mill rate will be reduced to 1,800 tons daily for treating the four-year supply available in the West mine. In the quarter ended March 31, 1944, copper and zinc had been recovered in larger volume than in any quarter in the mine's history. Since then the mine crew has been reduced by 125 men, whose places may not be filled until next fall. In the event of an increase in the copper price, production of the low-grade Bob Lake orebody would be economic, providing for milling at the 1,800-ton rate for a 4-year period.

QUEBEC

▶ At the annual meeting of Canadian Malartic Gold Mines the president, E. V. Neelands, reported reduced development work caused by labor shortages. A new orebody, No. 11, had been opened for a length of 250 ft. on the 25-ft. level. The grade averaged $5.40 a ton across 45 ft. for a block estimated to contain 200,000 tons. On the 1,125-ft. level a 40-ft. width had been indicated by drilling, with an average gold content of $6.55 a ton. Further work is being undertaken to extend this showing.

▶ Widespread interest has been revived in the Arntfield area of Beauchastel Township, located 12 miles west of Noranda, as a result of promising ore intersections reported from the first hole drilled by Wasa Lake Mines. Formerly known as the Wildcat property, extensive diamond drilling and a shallow shaft had indicated ore possibilities in 1936 and 1937. The new discovery is about 1,000 ft. north of the zone previously tested and includes the following intersections: 0.36 oz. gold across 24.5 ft. at a vertical depth of 380 ft.; 0.18 oz. gold across 4.9 ft. at a vertical depth of 400 ft. A second drill is testing the area developed by former operators. Arntfield Gold Mines is carrying on a drilling program to the west of Wasa Lake and Siscoe Gold Mines is engaged in testing ground to the southeast.

▶ Claiming a majority of the workers at Noranda, the Mine, Mill and Smelter Workers Union (CIO) has applied to the National Labor Relations Board at Ottawa for certification as bargaining agent at Noranda. The union is also reported

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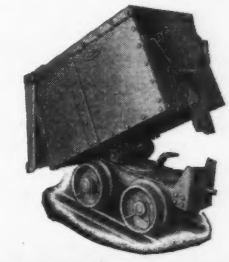

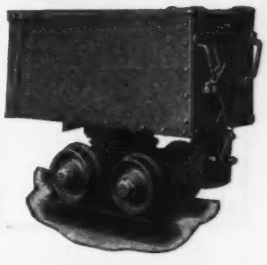

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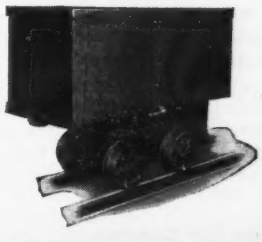

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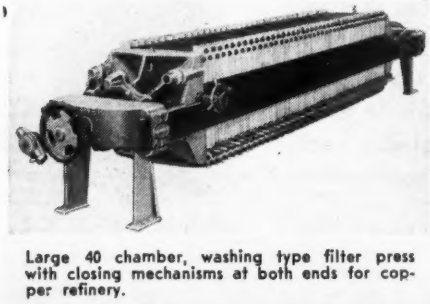

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Canada *(continued)*

to be conducting active organizing campaigns at Hudson Bay Mining & Smelting and Sheritt Gordon. Authorization elections were recently won by the CIO union at Golden Manitou and Lamaque mines, at Val d'Or, Quebec.

BRITISH COLUMBIA

▶ As in all War Loan drives to date, British Columbia mining companies made substantial purchases of bonds in Canada's Sixth Victory Loan, the sale of which has just been concluded. Among the larger subscriptions were the following: Consolidated Mining & Smelting Co. of Canada, Ltd., $7,850,000; the pension fund of employees of Consolidated Mining & Smelting, $250,000; Silbak Premier Mines, Ltd., $150,000; Premier Gold Mining Co., Ltd., $100,000; Sheep Creek Gold Mines, Ltd., $100,000; Granby Consolidated Mining, Smelting & Power Co., Ltd., $100,000; and Yukon Consolidated Gold Corp., Ltd., $125,000.

▶ The "easy" situation now obtaining with previously strategic minerals has not retarded in any marked measure the quest for mining properties in British Columbia and in the Yukon. Most of the prospectors are again searching for gold, but several parties are again active in the Omineca district, where the principal discoveries to date have been in cinnabar and scheelite. Contractors on the Skeena River highway have underwritten the cost of prospecting parties in western Omineca and Skeena districts.

▶ Gross income of Consolidated Mining & Smelting Co. of Canada, Ltd., from the sale of smelter, chemical, and fertilizer products during 1943, was $56,678,175. After all operating expense and provision for income, excess profits, and mineral taxes, depreciation of plants, investments in subsidiary companies, development, exploration, and expenditures for abandoned development in mining properties, net profit was $9,096,959, equivalent to $2.78 per share. Distribution of $8,189,569 was made to shareholders in the form of $1 per share as dividends and $1.50 per share as bonuses. In accord with previous policy $4,000,000 was transferred from appropriated surplus to unappropriated surplus. Working capital was again strengthened and the sum of $4,000,000 was provided from unappropriated surplus to be added to the reserve for postwar contingencies. During the year 2,500,714 tons of ore was mined at the Sullivan property. Both grade and tonnage were below those of the previous year. For the first time in several years development work, due to the shortage of labor, was insufficient to maintain ore reserves, which declined by 1,600,000 tons. Production of refined metal from the Trail plants showed a reduction from 1942, due to the increase in ore receipts from the Sullivan mine. Production costs were increased as a result of lower output and the shortage of experienced labor. Development work at the Pinchi Lake mercury mine, though limited by the inadequate supply of labor, opened several rich stopes, and the ore-reserve

position at the end of the year was favorable. In his report to shareholders, S. G. Blaylock, chairman and president, states that exploration promises to increase the company's mercury holdings and indicates valuable extensions to known gold reserves in the Northwest Territories.

▶ Shareholders of Privateer Mine, Ltd., former Zeballos district gold producer, have, by a large majority, authorized the continuance of investigations and negotiations with a view to making the company a major participant in the establishment of an iron and steel industry at Zeballos. Should such an undertaking be warranted, it is proposed that Privateer turn over its extensive holdings of iron ore deposits, present plant, and camp buildings to a new company to be known as Zeballos Iron & Steel Co., Ltd. It is suggested further that Privateer invest liberally in the capital essential to initial financing. At the extraordinary general meeting called to consider the matter, D. S. Tait, president, reported that negotiations now under way precluded him from stating the amount to which Privateer might be committed and made it impossible to even assure control of the new company. Full confidence in the directors was voted at the meeting, which was adjourned for 90 days so that more information may be obtained. During the nine months of operation in 1943 Privateer produced gold and silver valued at $525,075. Net operating profit after all expense and provision of $60,209 for depletion and $14,102 for depreciation, was $129,291. Dividend disbursements of 8c. per share required $171,786.

Always active in the exploration field, the company has currently under development a deposit of Iceland spar crystals in the Kamloops mining division, and a gold property in the Omineca division. At the latter, drifting of 110 ft. on a vein averaging 14 in. in width has given average assays of 2.15 oz. gold per ton. Both faces are still in ore, and a raise to the surface has proved the vertical persistence of the body. Experiments to date have not revealed a successful method of recovering the spar crystals in the area first mentioned.

▶ Industrial Metals Mining Co., Ltd., plans the erection of a 50-ton mill at the Little Billie copper-gold property, on Texada Island, Nanaimo mining division.

▶ Operating profit of $131,014, including accrued gain applicable to shipments during the period, was earned during the first quarter of 1944 by Granby Consolidated Mining, Smelting & Power Co., Ltd., Similkameen mining division. After provision of $21,326 for mineral, income, and excess profits taxes, and $69,782 for the reserve for depletion and depreciation, net profit was $39,906. A semi-annual dividend of 15c. per share will be paid June 1 to shareholders of record May 15, subject to the approval of the Foreign Exchange Control Board.

▶ Hedley Mascot Gold Mines, Ltd., Osoyoos mining division, during its limited period of production in 1943, obtained revenue of $514,533 from the sale of concentrate and gold bullion. After all operating and administrative costs, a gross profit

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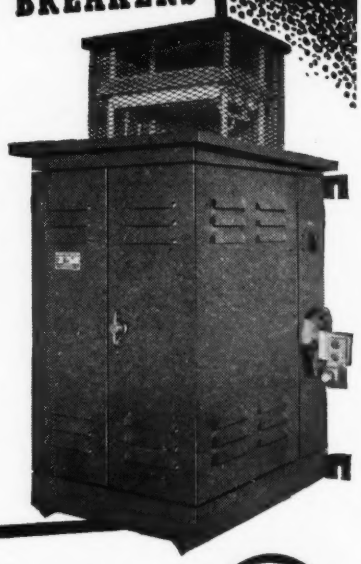

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Canada *(continued)*

of $85,520 was earned. Provision for depreciation was $75,693 and for taxes, $6,129, leaving profit for the year, before providing for depletion, at $3,699. Milling was suspended last September in an effort to advance mine development. This program was successful in establishing, by Dec. 31, 1943, ore reserves estimated at $164,792 tons, averaging 0.364 oz. gold per ton. The annual meeting of shareholders was advised by Dr. Victor Dolmage, consulting geologist, that substantial additions to reserves have been made since the first of this year. The mill was reopened in March, and production is nearing capacity. The company is currently developing the Wheeler property, a promising gold-telluride prospect 2½ miles east of the Mascot Fraction.

▶ Shareholders, at an extraordinary general meeting, have accepted the offer of North American Mines, Inc., of Boston, Mass., to purchase all assets of Gold Belt Mining Co., Ltd., for $150,000, to be distributed among all shareholders other than the purchaser. As a result Gold Belt shareholders will receive payment of 31½c. per share. Auditors have adjudged only 3½c per share to have derived from earned income and therefore subject to income tax. Formerly North American owned 1,237,000, slightly more than 48 percent, of the 2,550,000 issued shares of Gold Belt. Sheep Creek Gold Mines, Ltd., operating an adjoining property, was offered an opportunity to buy Gold Belt but failed to make as attractive an offer as North American Mines. No attempt was made to vote the Boston company's shares until it was evident that the offer was acceptable to a large majority of the remaining Gold Belt shareholders.

▶ Sheep Creek Gold Mines, Ltd., Nelson mining division, produced gold bullion valued at $304,962 from 19,332 tons treated in the nine-month period ended Feb. 29, 1944. After operating costs of $148,044 and provision of $43,411 for taxes, $26,850 for depletion, and $7,800 for depreciation, net operating profit was $89,978, equivalent to 4½c. per share. During the same period the wholly-owned subsidiary, Zincton Mines, Ltd., lead-zinc producer in the Slocan mining division, received smelter returns of $517,771. Net profit, however, cannot yet be determined.

MEXICO

General strike shuts all metal mines in country—Workers ask 50 percent wage increase

▶ Mexican metal mining came to a complete halt on June 8, when about 75,000 men, representing 105 companies, went out in the biggest strike seen since President Camacho took office in 1940. Seeking wage increases of up to 50 percent in addition to the recent nation-wide wage boost, the union had first called the strike for May 4, but heeded the President's wish to arbitrate and had moved the

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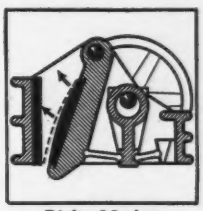
Let's see why it is impossible to balance ordinary crushers—

It is an established fact that it is mechanically impossible to counter-balance reciprocating motion by circular motion. The Blake type crusher, shown at the right, has a *single* heavy swing jaw operated by a *single* pitman and toggles. Now let's analyze the motion in this machine. We will start with the eccentric and the pitman at the bottom of their stroke, the toggles pointing down and the jaw open. As the eccentric revolves, it lifts the pitman and the ends of the toggles. As the toggles lift and straighten out, they move the swing jaw toward the stationary jaw, at the same time swinging it *upward*. Note how all these heavy masses move *upward* together until the eccentric reaches the top—and then they all *come down* together. As there is no opposing reciprocating motion to counter-balance this heavy mass, this machine can never be balanced, and must be run slowly. Counterweights on the flywheel can only be used to balance the eccentric.

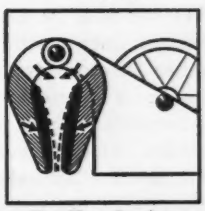


Blake Motion.

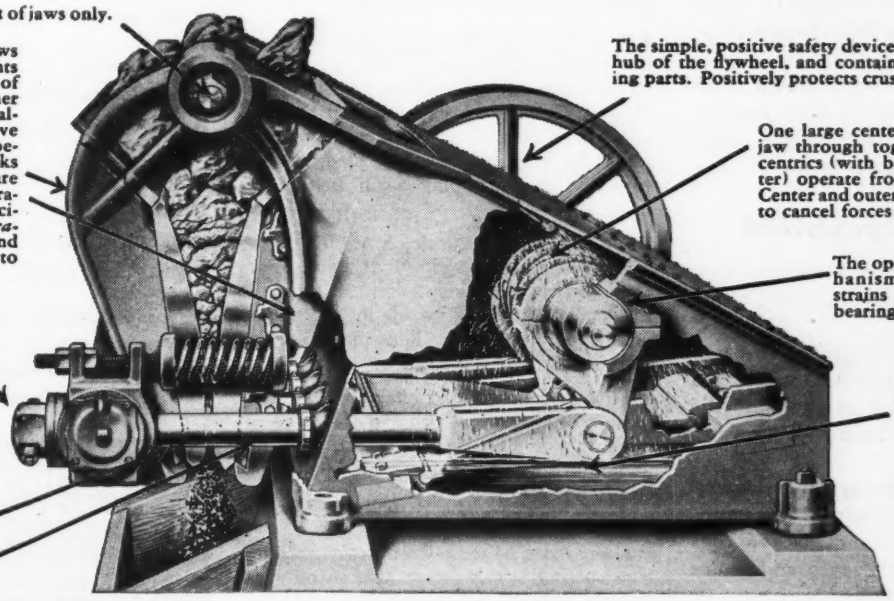
In the overhead eccentric type shown at the right, again we have two motions—Circular and Reciprocating. In this machine we have a *single* jaw which moves *downward* and, at the same time, toward the stationary jaw. Then it moves *up* and away from the stationary jaw. The toggle is also unbalanced. Here again there is no opposing reciprocating motion for counter-balancing. Counter-weights on the flywheel can never balance this mechanism, so speeds and output must be low. As crushing is only done during crushing strokes, fewer crushing strokes mean less crushed rock.

Overhead Eccentric Motion.

Now see how every moving part on a KUE-KEN is counter-balanced by another part of equal weight moving in the opposite direction. First consider the eccentric shaft with its circular motion. There are two counter eccentrics, each half the weight of the single center eccentric. The throws on these two outer eccentrics are equal to and opposite to the center eccentric. Therefore the shaft itself is in perfect balance. Note that this is circular motion counter-balanced by circular motion. On the center eccentric there is one pitman, while both outer eccentrics have pitmans with a total weight equal to the center pitman. As the center pitman moves up, the outer pitmans move down. Again we have perfect balance with reciprocating motion counter-balanced by reciprocating motion. Now consider the long pendulum type jaws with the upper hinge pin over the center of the crushing zone. As shown at the right, see how the jaws travel to and from each other in unison, with practically no lifting. Again we have perfect balance, reciprocating motion counter-balanced by reciprocating motion. This perfect balance, possible only in a KUE-KEN, reduces power and weight. It eliminates heavy flywheels and massive foundations and permits high speed efficient crushing.



Kue-Ken Crusher.



Hinge pins support weight of jaws only.

Two long symmetrical jaws hinged at the top. All points travel downward in an arc of circle as they move together in unison and perfect balance. As there is no relative up or down movement between the jaw plates, rocks are crushed by pure pressure without rubbing or abrasion. This exclusive principle of *crushing without abrasion* uses less power and makes jaw plates last five to ten times longer.

Accessible nuts are positively located on each side rod, locked in one posirion to prevent unequal adjustment. To change jaw opening, merely remove nuts and add spacers (furnished in various thicknesses), and replace nuts to locked position.

The exclusive KUE-KEN design of rear jaw plate lugs, which permits jaw plates to be worn entirely away without wear on jaw stock itself.

The simple, positive safety device is not visible. It is in the hub of the flywheel, and contains no shearing or breaking parts. Positively protects crusher from tramp iron, etc.

One large center eccentric operates rear jaw through toggles, and two outer eccentrics (with bearing area equal to center) operate front jaw through toggles. Center and outer eccentrics are 180° apart to cancel forces and balance mechanism.

The opposed and balanced mechanism eliminates crushing strains on the shaft and frame bearings.

In *addition* to the splash lubrication, cool oil is pumped from the large dust tight, sealed oil reservoir through an integral filter and then into the shaft bearings and toggles, giving perfect lubrication. A pressure switch automatically stops the crusher if oil supply should fail.

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What's New IN SAFETY

NEWS ABOUT SAFETY EQUIPMENT AND METHODS

Lamp Bracket

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The Airlined model of the Hard Boiled Hat can now be equipped with a one-piece molded plastic lamp bracket—for either electric or carbide lamp. The bracket is identical for either.

Simplification of ordering has been carried out completely in this new hat. Because the head size is completely adjustable to the individual wearer, only one size hat need be stocked to fit all workers. All parts are interchangeable—within the hat or with other hats.

The radically new style crown is so designed that it presents natty appearance and real protection on either large or small persons—men or women.

Clip-on Eyeshield

To protect hard hat wearers from flying chips, scale or grindings, Bullard offers the clip-on eyeshield.

This shield is so designed that it will fit on the brim of any protective hat. No holes need be drilled in the hat; the spring tension clips hold it securely to the brim.

Shatter-proof, heavy acetate facepiece offers unobstructed vision; will withstand light impact, and is generous enough to protect the eyes and entire face, without hampering movement.

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EVERYTHING BULLARD IN SAFETY

Mexico *(continued)*

strike date to May 24. At that time, it has been reported, a further postponement of 15 days was agreed upon.

Representatives of mining employers, including A.S.&R., Penoles, Fresnillo, and Cananea, are conferring with Ing. Gustavo P. Serrano, president of the Mining Chamber of Mexico, and Juan Manuel Elizondo, secretary-general of the union, in an effort to resolve the difficulty. These talks are held under the auspices of the Labor Ministry, and are supervised by Lic. Manuel R. Palacios, Subsecretary of Labor. The union has accused the employers of indifference in conducting negotiations, but talks with representative employers indicate a different attitude on their part. Most employers are opposed to a pay rise of the amount asked, on the ground that it would put them out of business. The employers point out that the peak demand for Mexico's mineral products appears to have passed, and that it will be even more difficult in the future to maintain high wage scales than it is now. Some employers feared that the union's action might force a government seizure of all mining enterprises, with an eventual expropriation of the sort undergone by the oil companies. This possibility now seems rather remote, however, in view of the government's apparent unwillingness to enter the dispute too actively.

▶ Lack of fuel oil for its engines forced Kildun, Matehuala, San Luis Potosi, to suspend operations. About 1,300 employees are therefore idle. Recent emergency shipments of oil furnished by cooperative action of the National Railways and Petroleos Mexicanos averted an earlier shutdown, but these agencies have been unable to sustain such deliveries. The Labor Ministry is attempting to arrange an adequate fuel supply for the mine.

▶ Breakdown of the electric power plant has forced a shutdown of the San Rafael cooperative society's mine at Pachuca, Hdgo. The society has appealed to state and federal governments and to the miners' union for help in getting the plant, and in turn the pumps, going again before the mine is flooded.

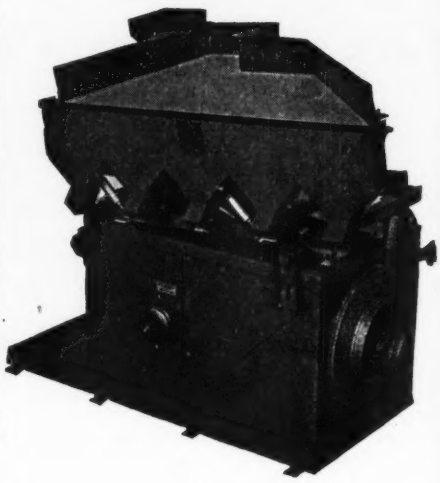
▶ Cia. Estano del Norte, S.A., Joseph E. Shaw, president, and Guillermo Rosas Gutierrez, vice president, has established a tin concentrator at Cerro de los Remedios, near Durango City. The plant is the first of its kind in Mexico.

▶ First evidence of the effect on Mexican mining of the recent drop in the price of mercury was given by the Labor Ministry in permitting dismissal of more than 100 employees by mercury mines in the San Marcos district in Zacatecas.

▶ Homestake Mining Co., Lead, S.D., is constructing a manganese concentrator at its properties in Baja California.

▶ The Supreme Court recently handed down a precedent-setting ruling on the federal labor law when it set aside decision of the federal Board of Conciliation and Arbitration absolving Cia. Minera Piedra Bola, S. A., operating in Jalisco, from paying an overtime "seventh day" to employees on paid vacations. Section 24 of the

Air Tables for Dry Classification



Grading of dry metallic or non-metallic materials into sizes may now be done without the use of screens.

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FOR THE

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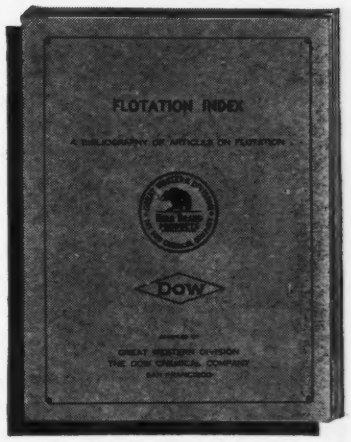

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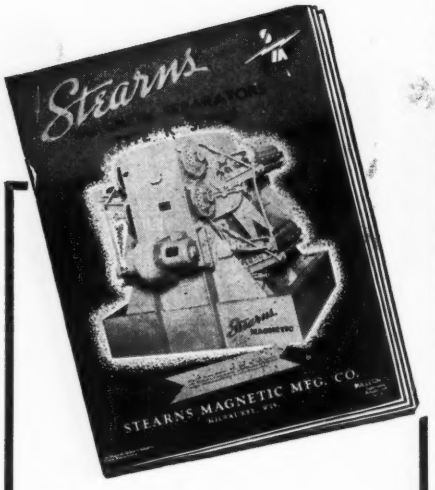

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Mexico *(continued)*

Miners' union had appealed the decision to the Supreme Court. The court ruled that employees on paid vacations must receive extra pay for their weekly day off if that day falls within the vacation.

▶ Dos Estrellas Mining cooperative, working properties at El Oro, Mich., that were abandoned by the original French-owned company some years ago, has asked President Camacho to order exercised in its behalf a law enacted some time ago that allows mining companies in financial difficulties exemption from federal taxes until their economic condition improves. The Dos Estrellas group turned in a long report showing that its present income barely covers expenses.

▶ Lack of water is hampering mining operations at Mineral de Santa Rosa, a mining community in Chihuahua. Help of state and federal government agencies has been asked.

CHILE

Andes Copper's position discussed by mediator—Nitrate producers in difficulties

▶ The following discussion of the situation of Andes Copper Co. in Chili and of the position of nitrate mining companies there was received as a news letter from our Santiago, Chile, correspondent:

The strike that occurred at Potrerillos recently is worth commenting on in so far as the decision reached by the arbiter, Senor Aliaga, Under-Secretary of Labor, reveals some interesting facts about the costs and working conditions at this Chilian subsidiary of Anaconda Copper Mining Co.

Though actual mining costs of the three Chilian porphyry coppers are not known here with any degree of certainty, it had been guessed for some time in local mining circles that Andes Copper was having some difficulty in making both ends meet. Despite excellent management and splendid underground mining methods, which had resulted in maximum production since Pearl Harbor, the enterprise has had too heavy an uphill battle against metallurgical problems, heavy taxation, decreasing grade of ore, increased production costs, and obsolescence of mill equipment.

When discussing the capacity of Andes Copper to pay higher wages, the arbiter established that the company had been unable during the past five years to pay any legal bonuses out of profits as provided by law. Moreover, it was stated in the decision that in the year 1942 there had been a deficit.

It was further established that the company had been receiving for its copper, 11.25c. per pound, but that under Chilian law, which provides for an extra wartime tax on copper, the company received only 10c. per pound. This extra tax taxes all the excess over 10c. if the price is between 10c. and 11.25c. and 50 percent of the excess over 10c. if the price is more than

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A Telsmith 18″ Intercone Crusher was selected for the secondary crushing. This compact, all-steel reduction unit crushes a 2″ feed to −⅝″ at the rate of about 20 tons per hour. Its product was so uniform and contained so little oversize that it was found possible to eliminate a third roll crusher from the crushing circuit.

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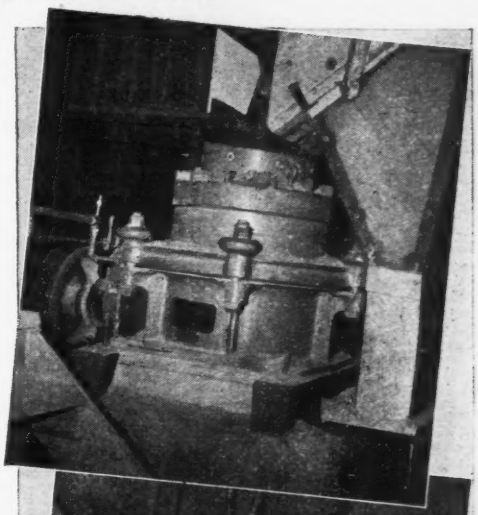

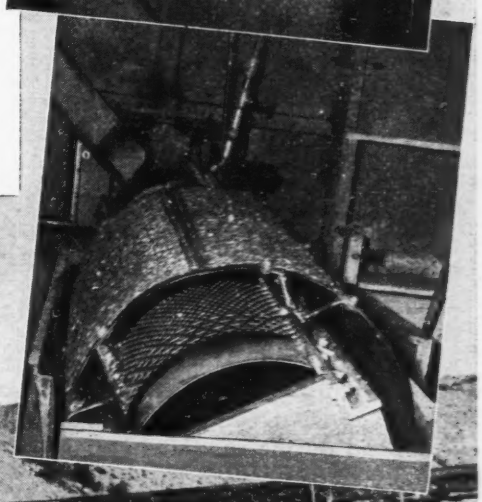

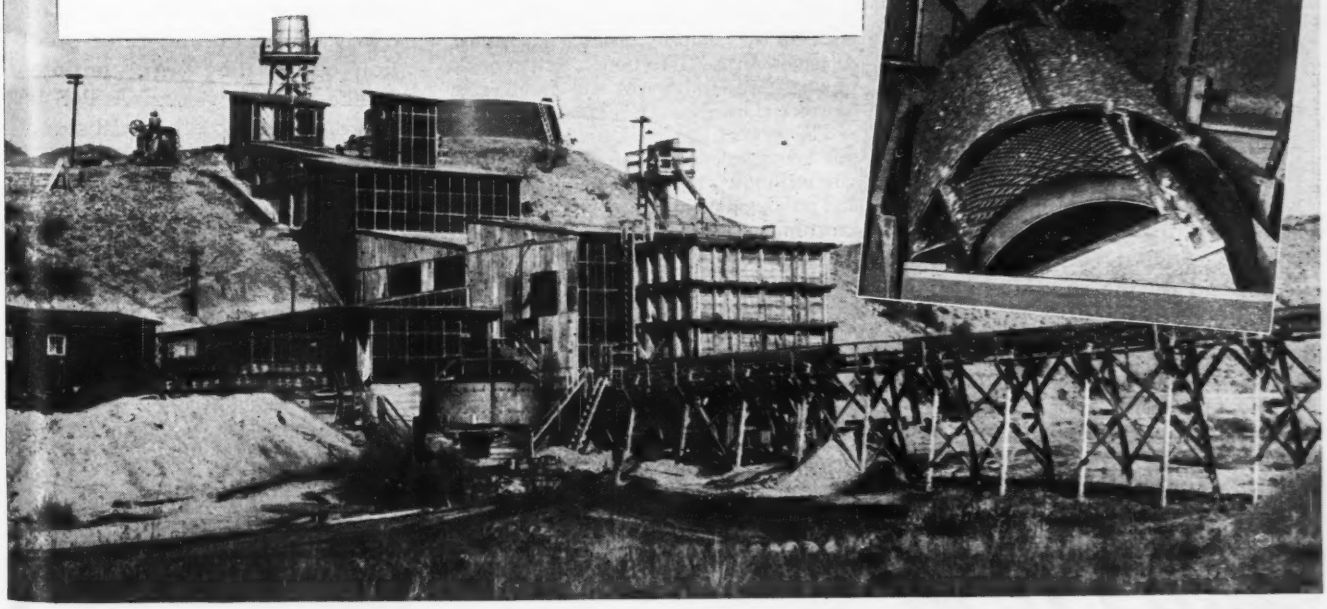

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Chile *(continued)*

11.25c. Because production costs of the company are 9.6c. per pound, the margin of profit was regarded as too small at a time when the company's one asset, its ore reserves, was depleted at an abnormally high rate.

Under these conditions, the arbiter reported, Metals Reserve Co. agreed to pay Andes Copper Mining Co. a small extra price for its copper to enable the company to carry on without loss. This premium price has allowed the company to maintain operations, pay the special government tax of 1.25c. per pound, and maintain a profit, but, the arbiter concludes, if production costs continue to rise, there will be danger of a contract stoppage of production by the company.

However, the arbiter decided upon a wage increase of 5 pesos per shift, about 16c. U.S.Cy., to help workers meet the increased cost of living. This will represent in the aggregate an increase in the company's payroll costs of about $1,000 per day.

▶ Andes Copper has had a most interesting experience in its attempt to help its workers keep down their living costs. Because the isolation of the mine requires that the camp be a self-contained unit, the company runs the stores, and for several years goods have been sold here at less than their cost to the company. Prices have risen steadily in Chile in inverse proportion to the debasement of the currency, and the company has been losing about $0.77 daily per man in trying to hold company store prices at reasonably low levels.

The natural result of the artificially low company store prices was that many workers bought unduly large quantities of goods, and then sold them at handsome profits in outside communities. The size of the potential profit was indicated in the arbiter's report, which showed that prices in Chanaral were four to eight times the prices in the company stores at Potrerillos. At Senor Aliaga's direction, a system of rationing, based on wages and family size, has been installed at Potrerillos.

The verdict rendered by Senor Aliaga was generally regarded as just, and, with rare unanimity, the government, the press, and public opinion backed his decision and unsparingly censured the workers for what was considered a most regrettable and unjustified strike bound to bring in the long run disrepute and loss of prestige to organized labor in Chile.

▶ Nitrogen-fixation processes have played havoc with the once most prosperous of Chilian industries, the mining of nitrates from the natural salt pans in the desert extending northward from Taltal to the Peruvian border. Until discovery of the Guggenheim-Cappelen Smith process as now used in the large and modern plants of Maria Elena and Pedro de Valdivia, sodium nitrate was recovered from the caliche by the old and inefficient Shanks process. Although costs were high in the Shanks process, the producers were unworried because, with their natural monopoly, they could fix prices to suit their costs. This happy state ended with the advent

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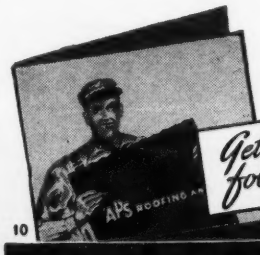

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This design is typical of Northwest quality. It's no wonder that Northwests are recognized for their trouble-free service at low cost. It's expensive to build but it pays dividends in longer machine life and more trouble-free service.

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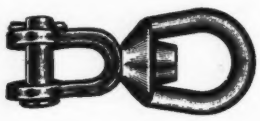
This hook's unique, stout-springed safety latch holds its burden securely despite strain or jolts. That's why workers like it — it's safer.

This latch is available on all sizes and styles of Laughlin hoist hooks.

LAUGHLIN THIMBLES: Two styles . . . regular and plow steel pattern (extra heavy for use with plow steel and high tensile wire ropes).



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FORGING A SHARE IN VICTORY

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Chile *(continued)*

of the Haber process just before the First World War.

The Santa Luisa nitrate plant in Taltal became one of the most famous in the country because it had not banked its fires in 70 years, and despite cycles of depression in the industry, it has kept manfully going until its record of uninterrupted production stands unchallenged. But, as T. A. Rickard once said, "Even Methuselah died," and the long and useful life of Santa Luisa has come to an end.

In order to be allowed to close down Santa Luisa, the owners, Lautaro Nitrate Co., Ltd., will have to give up to the government all the urban properties it owns in the Taltal department, which are valued at $17,700; will have to contribute $200,000 to establish permanent industries in Taltal, such as fishing, and must pay $16 each to married workmen and $10 to the single men who cannot be employed in other company plants.

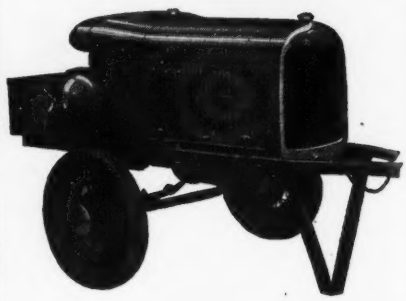
Two other old and well-known Shanks nitrate plants are threatened with closure. These are the Santa Laura and the Rica Aventura, both of which belong to Tarapaca & Antofagasta Nitrate Co.

BRAZIL

Another lead smelter for Parana —Coal mining increases — New steel plant on the way

▶ Plumbum, S. A., is completing a lead smelter at Panelas, State of Parana, which it is expected will be blown in about the first of June. The company's nearby lead mine was discovered in 1937, but was worked only until 1940, when operations became unprofitable. Mining is now to be resumed and two crews of the Departmento Nacional da Producao Mineral are developing new reserves with diamond drills. The smelter comprises a No. 4 Mace sintering hearth, a No. 4 Mace blast furnace, and a Parkes process refinery with a capacity of 20 tons of refined lead daily. Arthur E. Hall designed the plant and is in charge of operations. This smelter will be the second such plant in Brazil, the first being a pilot smelter at Apiai, built and operated by the Sao Paulo government. This plant had a capacity of 10 metric tons of lead daily, but it was shut down in October, 1942, and has not run since, though a new refinery is reported under construction there.

▶ Coal mining is on the increase in Brazil and has now passed the 2,000,000-ton a year level, but no exact figures have been released. The coal mines of Santa Caterina are being equipped to supply the washed-coal concentrate requirements of the new Volta Redonda steel plant. Production in Santa Caterina will be 1,000 tons of coke daily in September, according to Col. E. Macedo Soares e Silva, technical director of the Cia. Siderurgica Nacional. Fairly low-ash coal is mined in Parana for railroad and industrial use in Sao Paulo, and production will increase there when a railroad spur is completed to the mines.



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Brazil *(continued)*

About 5,000 tons of coal monthly are expected to be mined from the newly discovered coal deposits at Cerquilho in Sao Paulo.

▶ A new all-time record for charcoal pig iron was established last year when production reached a total of 225,000 tons. Charcoal was used as fuel in 25 blast furnaces with capacities ranging from 10 to 100 tons per day. About half of this pig iron was refined to steel in open hearths heated by the blast-furnace gases. Six new charcoal blast furnaces are expected to begin operation this year, and total production should reach about 330,000 metric tons. The first coke blast furnace in Brazil will be the Volta Redonda No. 1, a full-size unit with a capacity of 1,000 metric tons daily. Designed and erected by Arthur McKee & Co., of Cleveland, Ohio, the new furnace will be blown in late this year.

ECUADOR

Cotopaxi Exploration finds new ore — Highway construction progresses—New gold discovery

▶ During March, Captain Jorge Ribadeneira, who was Director of Mines for the government, resigned his post to become Military Attache in the Republic of Panama. Appointed to replace him was Dr. Ernesto Alban Mestanza, a chemical engineer of Quito.

▶ It is reported by the Ministry of Mines that during 1943 the Banco Central (sole authorized buyer of gold) purchased an average of about 400 oz. of placer gold per month. This originates from many small hand operations carried on in various parts of the country and is estimated to represent approximately one-third of the actual production from these sources. Purchases in December and the first three months of 1944 fell off to an average of only 120 oz. per month.

▶ A total of 265 mining claims were denounced in various parts of the country during 1943. These covered a wide variety of minerals and metals, with gold and quartz crystal predominating. To date none of the quartz-crystal prospects is known to have produced crystals of commercial quality.

▶ During March a rather spectacular showing of placer gold was discovered in a small south-side tributary of the Rio Pilalo, about 15 kilometers west of Macuchi. Up to 3-oz. nuggets were found, but by May 1, no sign of a lode source had been uncovered. The region in which the discovery was made is jungle country, and the immediate vicinity is called "California." The "rush" that took place resulted in a rather serious shortage of labor at the Macuchi copper mine of Cotopaxi Exploration Co.

▶ Recent exploration development carried out by the Cotopaxi Exploration Co. on its 2,180-meter level has opened some

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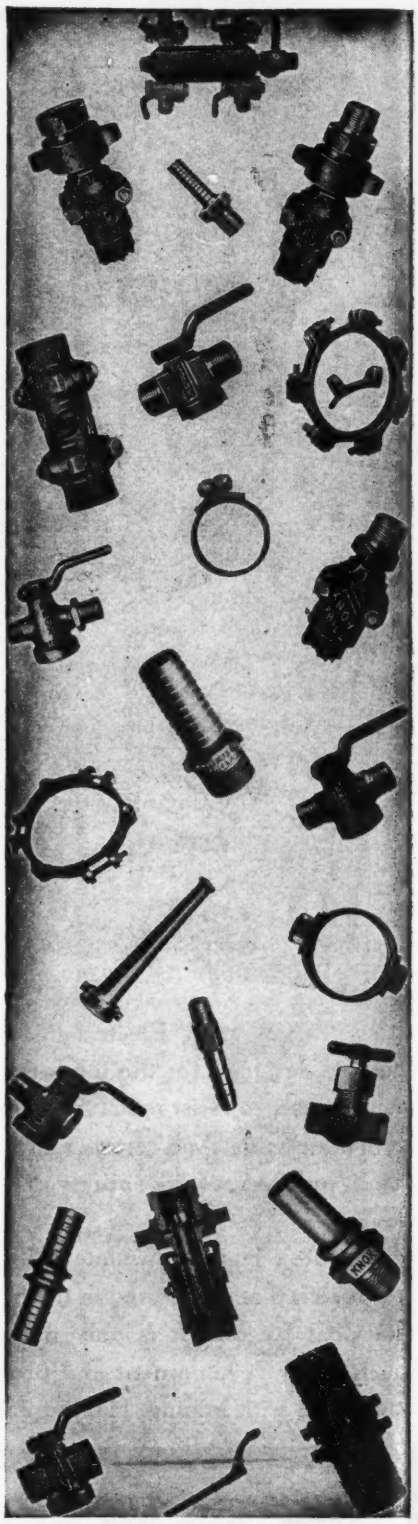

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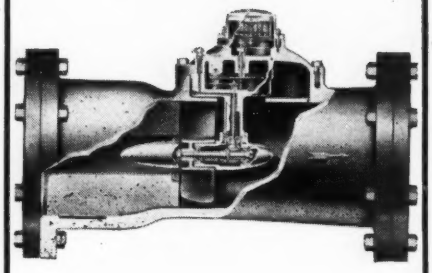

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Ecuador *(continued)*

encouraging mineralization. This is on the border of an alteration "bulb" similar to that which accompanies the Mercedes orebody, and is about 1,500 meters south of the Mercedes mine. A second adit (2,045-meter level) has been started to explore the new showing at depth. Diamond drilling is used extensively in conjunction with underground and surface exploration. The drilling is done on contract with Sprague & Henwood, of Scranton, Pa. Rugged topography and abundant rainfall present many problems.

► Construction work on the Macuchi-Zumbagua highway has been continued without interruption through the rainy season, and it is now estimated that the road will be open for traffic some time next fall. The work is being financed by the government from production taxes received from Cotopaxi Exploration Co. and is being administered by this company on a non-profit basis. The road, when finished, will constitute an important link between the coastal plain and the inter-Andean area. In the 45.5 m. between Macuchi and Zumbagua it climbs from an elevation of 1,700 meters up over a pass in the western Cordillera that has an elevation of 4,300 meters.

► At Minas Nuevas, near Zaruma, in the Province of El Oro, the Calera Exploration Co. has for the past year and more limited its work to maintenance only, due to the impossibility of acquiring machinery and supplies needed to equip the property for production. Studies are now being made for constructing a 10-km. branch road to the mine from a point on the Loja-Piedras highway.

► In the Portovelo Mines of South American Development Co., near Zaruma, recent developments on the 9th level have opened some favorable showings on the Nudo and Cantabria veins, which are of base-ore type. The new showings are from 500 to 900 meters north of the American (main) shaft, and an interior shaft is being started in their immediate vicinity which will extend from the 7th level to the 11th level, and later to greater depth if necessary.

► Exploration to the north on the S level in the Sesmo mine was recently resumed by South American Development Co. at Zaruma.

► Jan. 13 marked the completion of construction work on the last link of the highway connecting the interior of southern Ecuador with the Puerto Bolivar-Piedras railroad. The road was opened for traffic on Oct. 30, 1943. On Dec. 8 it was formally dedicated by ceremonies carried out jointly by officials of the provinces of El Oro and Loja, and attended by the President of the Republic, Dr. Arroyo del Rio, in company with the Minister of Public Works, Sr. Miguel Cucalon Jimenez. The work was financed by government funds and administered by South American Development Co. on a non-profit basis. From the time the company initiated the work on the unfinished section on Oct. 6, 1942, to its completion in January, a total of 1,967,897 sucres was expended upon it.

AUSTRALIA

Labor shortage hinders Tindals Gold Mines—Government seen as unfair to copper producers

► The recently received annual report of North Kalgurli (1912), Ltd., for the year ended Dec. 31, 1942, shows a credit balance of £stg.59,267, after provision for taxation, depreciation, and development, a creditable record in view of the difficulties which face the mining industry. Owing to shortage of labor, development was on a restricted scale, but the results obtained were satisfactory, particularly on the North Kalgurli east lodes. As the result of war conditions, there was a severe fall in output and in revenue. During the year 108,665 tons of ore was mined, compared with 205,155 tons in the previous year, and the recovery of gold was 40,718 oz. against 63,337 oz. in the earlier period. Grade of ore treated was more than 1 dwt. per ton higher, the head value being 7.494 dwt. per ton. Ore reserves were estimated at 1,020,622 long tons of positive ore having an average value of 6.34 dwt. per ton, and 390,620 tons of probable ore assaying 5.74 dwt. per ton. Working costs for the year showed an increase of 10 percent over the figures for the previous year, which was satisfactory, considering the decrease in tonnage and increases in the cost of wages and stores. Costs were: one extraction, 10.85s.; ore treatment, 13.05s.; development, 4.75s.; general charges, 3.15s.; total cost, 31.80s. per ton.

► Tindals Gold Mines, Ltd., at Coolgardie, had difficulties during the year ended Dec. 31, 1942. The company, which owns 27 leases, has mined to a depth of 750 ft. The satisfactory way in which the mine had opened up, led to an increase in capacity of the treatment plant from 5,000 tons to 10,000 tons of ore per month. Unfortunately, the labor reduction throughout the State became operative just before the completion of the plant extensions, so that the labor force then available to the mine was insufficient for an output of more than 3,000 tons of ore per month. Consequently, on existing charges for wages and stores, profitable operation became difficult. Indicating the position, it was possible to complete only 327 ft. of development work during the year, all at the 600-ft. and 750-ft. levels, values disclosed being slightly below the average for the mine, though the widths were satisfactory. Ore milled during the period included 2,643 tons of oxidized ore and 40,469 tons of sulphide ore, making a total of 43,112 tons; head value was 4.31 dwt. per ton, residues assayed 0.48 dwt., and recovery was 88.86 percent. Recovery of metal was 8,266 oz. of gold and 1,048 oz. of silver. Ore was mined from all levels from 200 ft. to 750 ft., the width of the lode worked varying from 5 ft. to 45 ft. Operating costs in Australian currency were: ore breaking and extraction, 19s. 6.2d. per ton; ore treatment, 14s. 8.5d.; total, 34s. 2.7d. per ton. Development cost per foot was 117s. 9d.

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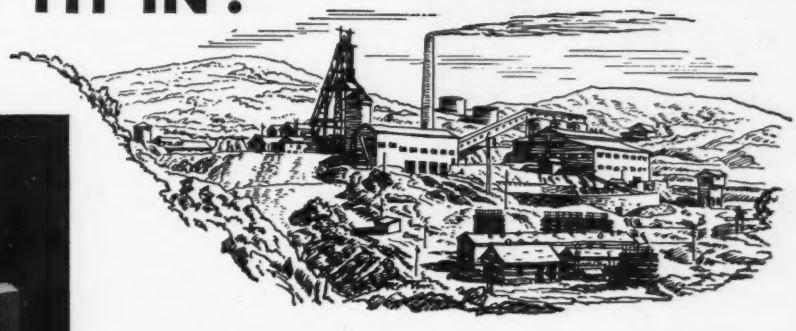

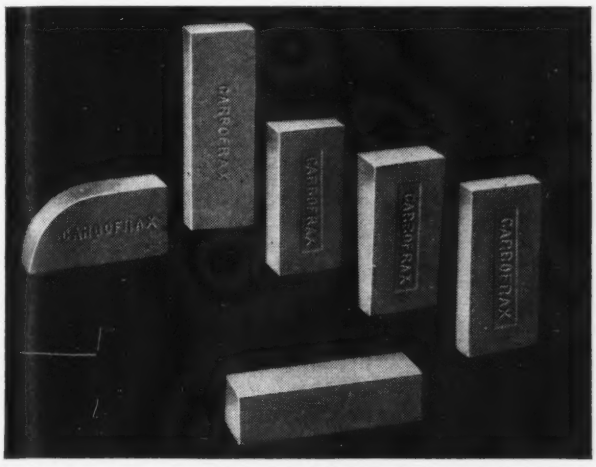

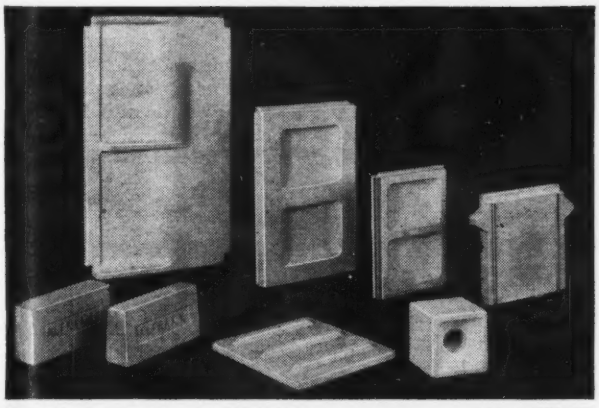

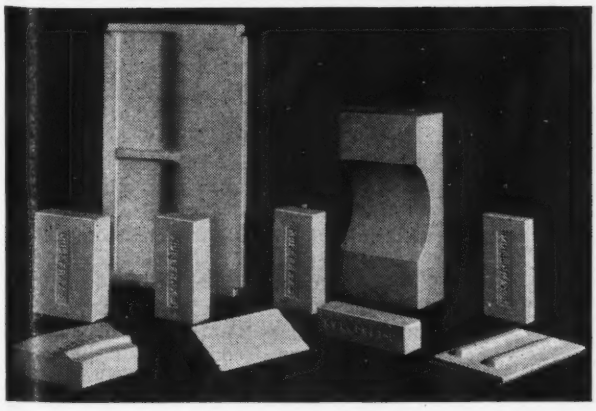

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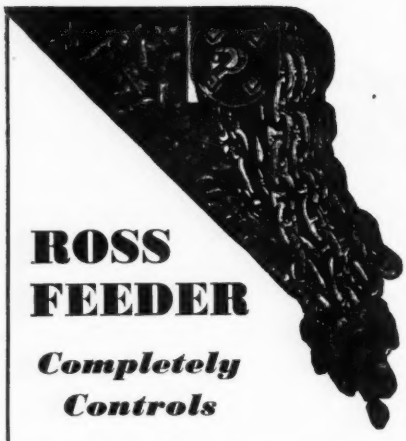

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Australia *(continued)*

QUEENSLAND

► Mt. Isa Mines, Ltd., Mt. Isa, in the Cloncurry district, earned a profit of £A86,134 in the year ended June 30, 1943, before allowing for normal depreciation but after charging interest on debentures, loans, and overhead expenses. The year was marked by serious difficulty in maintaining manpower; by a decline of 221,150 tons in the production of lead-zinc ore compared with the figures for 1942, and 374,354 tons in comparison with 1941; and the development of the copper orebody and the commencement of production of blister copper, for which purposes it was necessary to transfer a considerable number of men from the lead-zinc section of the mine. Because of the labor situation, there has been a decrease in reserves of lead-zinc ore, which are now shown as 7,055,210 tons of sulphide ore assaying 7.7 oz. silver, 8.6 percent lead and 8.5 percent zinc; carbonate ore amounted to 61,530 tons, worth 14 percent lead, making a total f 7,116,740 tons. Copper ore reserves were 1,073,700 tons of developed ore and 1,369,000 tons of prospective ore, which, with 20,100 tons of oxidized ore, made a total reserve of 2,442,700 tons having an average grade of 3.2 percent copper. The copper ore occurs in fractured shale considerably replaced by carbonate minerals, on the hanging-wall side of the Black Star silver-lead-zinc lode. It has been opened up between No. 7 and No. 9 levels. Above No. 7 level it does not appear to be of commercial importance.

Exploratory work included 10,936 ft. of diamond drilling, mainly on the Black Star copper orebodies at the elevations of Nos. 7, 8, and 9 levels, rather intensive drilling being necessary to delimit the mineralization to permit suitable stope design, owing to the irregular shape of the occurrences. In the previous year 12,637 ft. of diamond drilling was completed. Development work, exclusive of stope preparation, amounted to 2,966 ft., compared with 7.552 ft. in the preceding year, the greater part of the work being driving and crosscutting. Lead-zinc ore broken amounted to 362,308 tons for nine months, the rest of the year being devoted exclusively to copper-ore production. The average monthly tonnage mined was 8,365 tons less than in 1942, owing to shortage of labor, which was responsible for ore extraction exceeding ore prepared for stoping by 344,377 tons. Blast-hole drilling for stope preparation was continued: in the silver-lead-zinc section 48,261 ft. were drilled in preparing 113,456 tons of ore, average progress being 78.3 ft. per shift; in the copper lode, 58,928 ft. prepared 126,943 tons of ore, progress being 39.3 ft. per shift. Silver-lead-zinc ore milled totaled 354,661 tons and copper ore amounted to 75,241 tons. Operating costs in the lead section were as follows: mining and development, 8s. 8.88d; milling, 5s. 0.84d; smelting, 7s. 7.75d; administration and general expenses, 2s. 9.82d; delivery of bullion, f.o.b. Townsville, 2s. 5.32d; total, 26s. 8.61d.

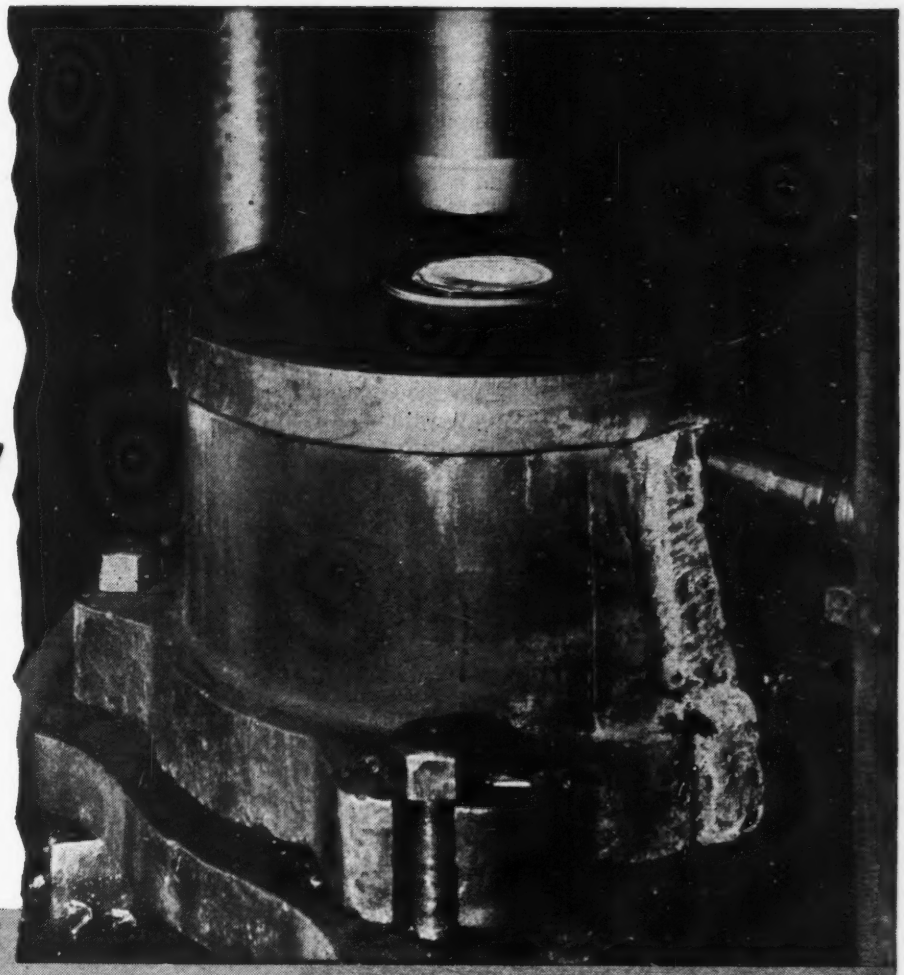
► At the annual meeting of Mt. Isa Mines, Ltd., the chairman of directors, Julius Kruttschnitt, made pertinent comment on the government attitude to copper production. He said that the Mt. Isa company, at the instigation of the Commonwealth government, had carried out an energetic program of ore development and treatment plant construction as part of the policy to make Australia self-sufficient as far as possible in metals required for the war effort, and it was expected that Mt. Isa's output, together with that from Mt. Morgan, Mt. Lyell, and other mines, would meet both commercial and war needs. Crews were accordingly trained and the first pour of blister copper was made on April 12, 1943. Before the middle of the year, it became apparent that imports from South Africa were causing a temporary surplus, and in November it was announced that there would be no market for Mt. Isa copper after January of this year. No thought was given by the government to the company's financial and metal programs, for, in effect, it was told to find a foreign copper market or to revert to the production of lead and zinc. The government disregarded the facts that an additional 375 men would be needed for lead and zinc production and that the company had spent nearly £A250,000 on developing its copper lodes and the construction of additional plant; also that the fate of more than 1,000 employees on the payroll and some hundreds of copper ore gougers, who send their output to the company's smelter, is dependent on the continuance of copper production. In the circumstances it was pertinent to ask whether the government wished deliberately to extinguish Mt. Isa's production in order to liquidate its own surplus of copper imported for emergency war purposes.

TASMANIA

► Mt. Lyell Mining & Railway Co., Ltd., Queenstown, earned a net profit of £A169,141 after charging prospecting and development, depreciation, and taxation, in the year ended Sept. 30, 1943. Particulars of metal production are not disclosed, but it was stated that there was an increase in the tonnage of ore mined and treated and a small decrease in grade. The tonnage of copper produced was less than that in the previous year. The open cuts at West Lyell were worked on the largest scale yet achieved, and the increase in production was from this source. The capacity of the transport fleets in the open cuts was increased by three more 20-ton semi-trailer trucks, and orders were placed for additional excavating and transport equipment.

In the concentrating plant metallurgical results remained constant, but the smelting recovery showed a marked improvement. Ore reserves were estimated at 14,070,000 tons of an average assay value of 1.14 percent copper, 0.07 oz. silver, and 0.012 oz. gold per ton. The basic wage in the district is now 93s. (Aust.) per week, with a "price of copper" allowance of 17s. per week. With this loading, the base rate has since risen to £A5-13-0 per week, compared with £A5-5-0 per week at the close of the previous year.

Bronze Repair Weld



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This salvage operation is only typical of the priceless emergency service rendered by such concerns as the Neal Welding Company of Cleveland, using Anaconda 997 and Tobin Bronze* for first aid in America's vital war production centers. Think of bronze welding before you think of scrapping any damaged machine part. 4488

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ANACONDA

Anaconda Welding Rods

Comments on Future of Gold and Silver

(Continued from page 82)

years." In terms of sterling at pegged value of $4, gold in large amounts (some days as much as 30,000 ounces) is being absorbed in the Bombay market at prices of $55 to $65 per ounce. The sale of gold in other markets such as Turkey, Egypt, and North Africa has also reached significant proportions. So large have these sales become that in South Africa, to allay protests of the gold producers, Premier Jan Smuts recently announced to the South African Parliament that the British government had agreed "to see South Africa raise the selling price of its gold from the present price of 8 pounds 8 shillings (South African currency), or approximately $34 an ounce." Here is the first step in the creation of a free gold market and a definite departure from the pegged price of $34 in South Africa.

Mr. Just's conclusion regarding silver, "The international outlook for this metal as a monetary base is doubtful—to help it internationally calls for positive and intelligent action"—merits careful examination. The present financial chaos in China and India might have been avoided if we had not drained silver from the Eastern countries by pegging our price above theirs. Hard silver money, not paper, is urgently needed in the Far East—and gold, because of its high unit value, is impractical for use in paying low wage scales.

Can silver be mined in sufficient quantities to meet the demands of industry, currency of the East, and coinage in Europe? With a normal postwar industrial demand indicated in the U. S. of about 50,000,000 ounces, against an annual estimated world's production of 175,000,000 ounces, there would be only 125,000,000 ounces left for the remainder of the world's currency and industry. The answer is that all, if not most of United States Treasury stocks, will be needed in the East to restore a currency balance, and the newly mined silver will be gladly absorbed in China and India. What price silver? Well, the old law of supply and demand will govern that.

ROBERT D. HOFFMAN

New York, N. Y.

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You asked for it—here it is:

Just what—Just nothing. Of all the pages and pages of Just floundering around on the modus operandi—chatter—a lot of language—after Spahr, Kemmerer, Morgenthau, Keynes, Eccles, and White.

Why in the name of God anyone woud take up such an amount of space with such claptrap—and the shortage of paper—while (so to speak) in the same breath cut the guts out of a master mind's article like Francis Brownell, and never publish Humphrey Mitchell's, not to say mine, is beyond the comprehension of a prospector. Better stop chattering and get back to my 14 to 1 sound money plan before it is too late. Better beat the gun. You know what Jackson said: The way to resume is to resume.

GEORGE H. WATSON

Salt Lake City, Utah.

Wants Free Market For Gold

The Editor:

I read your article "What's Ahead for Gold and Silver Money?" together with your invitation to correspond on the subject.

I believe that it is perfectly possible for the world to get along very well without the use of gold and of silver, except for industrial purposes.

The chief use of the commodity gold at the present time is for reserves. Do not let us call a reserve a monetary base. Money is not a structure. The term "base" is too figurative and rhetorical for accurate reasoning. The gold held by the Treasury is a reserve regardless of whatever else anyone may happen to call it, and if the government got stuck for funds it would sell off a part of its gold reserves.

Also let us not call a respectable individual reserve of precious metal a hoard. It is also a reserve available for unforeseeable contingencies. So are diamonds. So is a platinum ring. And so could silver be made a reserve metal if the use of silver were encouraged as an intermediate trading commodity and the habit of using silver restored and so the price of it increased.

You see what happened to silver. The government bought up so much that the world learned how to get along without it, and now the price in the open market is down.

WM. A. RHODES

New York, N. Y.

Distrusts the Experts and Advocates Bimetallism

The Editor:

The monetary question, I personally feel, is not only the most serious problem confronting the mining industry, but all business. Unless it is given serious attention by all businessmen, I am afraid our experts are going to cook us up a mess that will poison our entire capitalistic system.

I have been trying to digest their latest stew, published by the *New York Times*, under date of Saturday, April 22, and if that is a sample of what we are going to have for a monetary diet I am satisfied we are headed for the hospital. *The Times* editorial comment of April 24, having already analyzed the mess to my personal satisfaction, I feel their opinion should be broadcast to the entire world, and that our mining fraternity should sponsor a howling protest against such a moronic nightmare.

They should also sponsor and submit a realistic bimetallism platform, such as you have suggested in your March issue of the *Engineering and Mining Journal*. No group or individual should expect to criticize without being able to submit the antidote they believe would cure the ailment. Surely there are enough brains connected with the mining industry to outline a practical and equitable remedy to demand a hearing at the council table, while there is still time to act.

Bimetallism and standard currencies may not be a cure-all, but it certainly would help the silver-producing countries to have equal standing with the gold-producing countries. It would benefit the currencies of the silver users, such as China, India, and many others, practically three-fourths of our entire civilization.

William Jennings Bryan had an answer, but unfortunately for the world, including our gold producers, nobody seemed to have the slightest idea of what he was talking about, and naturally our experts, who knew less, were against him. What Bryan was trying to make us understand is that the production of silver equals 16 ounces to one ounce of gold. I find this to be substantially correct, so far as recorded production of these metals is concerned. In fact, according to my personal checking the figure should be 15 to 1.

In closing I say to hell with the experts. Let us get busy and submit something that at least seven men in the world will be able to understand.

ROBERT H. MALCOLM

Yonkers, N. Y.

Changing Gold Price Is Disruptive to Commerce

The Editor:

The articles reviewed by Mr. Just [?–Ed.] are proposals for deficit financing for the purpose of increasing prosperity by spending money rather than by earning it. Deficit financing is a prewar problem, not a postwar problem. Probably the only way in which a war confers any benefit on mankind is that it greatly accelerates the investment of capital, both public and private, and develops new materials and processes. These, converted to the production of those goods and services that add to prosperity, will make it possible to produce far more wealth with less labor than ever before, provided wages are determined by the market value of the production. But if the buying power of this huge investment is depreciated by increasing the price of gold, as was done in 1934, nothing can save the nation's credit.

The problem of unemployment was never solved after the last war, but, instead, the production of wealth was restricted and wages were paid in borrowed money. This cannot continue forever. The only remedy is to teach the people the truth. The postwar problem is one of education, and I suggest the following as a statement of the facts which the average voter can understand:

After the N.R.A. proved to be a failure, the President, in one of his fireside chats, proposed the 40-hour week as a cure for unemployment. Evidently many people believe that the more wealth produced, the poorer we become, and that if a man works long hours and earns a lot of money, he is depriving another man of a job. The truth is just the opposite: the more one man produces, the more there is to pay the wages of others. No doubt we could all earn a bare living working 30 hours a week, but there would be no market for automobiles, radios, or anything but food and clothes. No matter what the wages in dollars, it is the actual goods and services produced that determine the prosperity of a nation.

Reduce the problem to its simplest terms. Suppose there are two men marooned on an island. If each man works only long enough to produce what he consumes, the standard of living of *both* will be lower than if both work full time at what each is most proficient and exchange their production. The wages of one are determined by the production of the other. This is just as true with a million as with two. Each person exchanges his production for dollars, but the dollars can buy only what the others have produced. There may be overproduction of certain things, especially if foreign trade is restricted, but there never can be overproduction in general, for two reasons: first, because it is inconceivable that everyone should ever have everything he desires; second, because those who have everything they want will stop producing. This proves that the lazy ones cause unemployment, not the industrious ones.

Laws have been enacted and practices pursued for the purpose of increasing employment and prosperity by increasing the labor cost and restricting production, when actually the effect of such laws and practices is just the opposite.

Because no one will exchange the fruits of his labor for war materials, the government must buy them with the people's money, borrowed or from taxes. After the war the buying power of these wages and the scarcity of civilian goods will provide employment for perhaps ten years. Then, as in 1930, will come the time when wages and prices must drop to a lower level in order to restore the buying power of fixed incomes, of invested capital, of endowed institutions, of the huge investment in government bonds. At the lower prices, lower wages will buy many more of those things that add to prosperity than war wages will buy at the present time. Because wages were not thus lowered when prices dropped after 1930, but, instead, the value of the dollar was decreased by increasing the price of gold, this nation has been going deeper and deeper into debt at the rate of two billion dollars or more per year ever since. This cannot continue after the present war.

The New Deal philosophy that unemployment can be cured by spending more and producing less has cost this nation nearly as much as World War I. Had the voters known the truth, they would not have voted in favor of continuing this policy for 12 years. The wage earners are no more to blame than the wage payers. They are all in the same class. All those not supported in idleness by charity or taxes are both employers and wage earners. The wage earner employs his employer to manage the business and sell the production. He employs the farmer to feed him, the merchant to clothe him, and the capitalist to provide the tools and power. Farmer employs mechanic and vice-versa. If any of these stop working, the incomes and buying power of all will be reduced. The more wealth produced, the greater the prosperity of all. Production is buying power, item by item except for goods exchanged in foreign trade.

ARTHUR B. FOOTE

Grass Valley, Calif.

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HARDINGE

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EQUIPMENT NEWS

Self-Contained Paving Breaker

A new-style, completely self-contained, gasoline-driven paving breaker is being manufactured by Syntron Co., 510 Lexington Ave., Homer City, Pa. Shown in the accompanying photograph, the breaker weighs 96 lb., can be operated by one man, and uses a full range of points and tools with 1⅛x6-in. shanks.

The breaker is driven by a two-cycle gasoline engine with two pistons—one an engine piston, the other a hammer. The

latter acts as a cylinder head for the engine piston, and when the explosion occurs, it is driven against the shank of the tool and returned to firing position by the exhaust gases. The motor is started by rope pull. The attached tank carries fuel for several hours' operation.

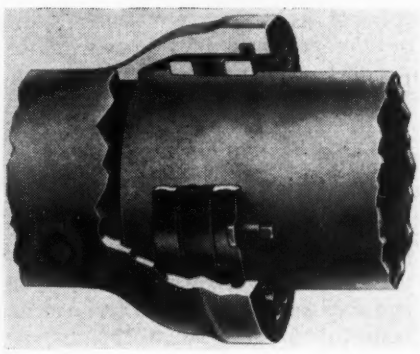
The company reports that several hundred of these hammers are being manufactured monthly for the armed forces, but that a few are available for shipment on high-priority orders.

Plastic Valve Wheels

An acid-resistant valve handwheel is now offered for use in all industrial applications, including mines and oil refineries, by Keyes Fibre Co., Waterville, Me. Using a Durez plastic called Kys-ite, the new handwheels are resistant to water, acids, and alkalies. They do not transmit heat or cold, they are unaffected by boiling water, and weigh about one-half as much as an equivalent wheel made of aluminum. The wheels are said by the manufacturer to have a high impact strength, and it is also reported that if a wrench is applied to the rim halfway between the spokes and extra leverage supplied by a pipe over the wrench handle, a pull on the pipe will twist the valve stem before the wheel will break. Details will be furnished by the manufacturer.

Cast-Iron Pipe Joint

Cast-iron pipe manufacturers are again able to supply Bellmaster pipe, and Dresser Mfg. Co., Bradford, Pa., announces that

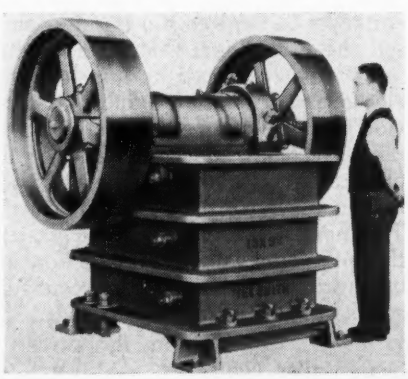


it is re-introducing its Style 85 Bellmaster joint for this cast-iron pipe. The joint is said to be fast, flexible, and tight; it is available in sizes as follows: 3-, 4-, 6-, 8-, 10-, 12-, and 16-in. CIP.

Cast-Steel Jaw Crushers

The first of an entirely new line of Telsmith roller bearing jaw crushers has been placed on the market by Smith Engineering Works, Milwaukee, Wis. The new crusher is 18x32-in. in size and is part of a line of nine sizes with capacities of from 5 to over 300 tons per hour.

The new Telsmith jaw crushers retain many of the features of the old Telsmith-Wheeling crushers, but offer certain improvements, as well, according to the manufacturer. The company decided after a lengthy investigation to continue using a cast-steel frame and swinging-jaw construction rather than to shift to welded-steel construction, despite the manufacturing advantages that the latter method might offer. With cast-steel construction, the company believes, there is no chance of weaving or cracking, with consequent misalignment of bearings and reduced crusher life. Complete details will be furnished by the company.



Conveyor Lengths Extended

Conveyor operations extending as far as 6½ miles in a single belt will be possible with a new steel cable "compass" conveyor belt, according to Goodyear Tire & Rubber Co., manufacturers of the belt. Brass-plated ⅜-in. steel cables are laid side by side the full length of the belt, and greatly increase both the range and capacity of single-belt conveyor installations. Goodyear has been producing steel-cable endless-transmission belts since last fall.

Heavy-Duty Truck Crane

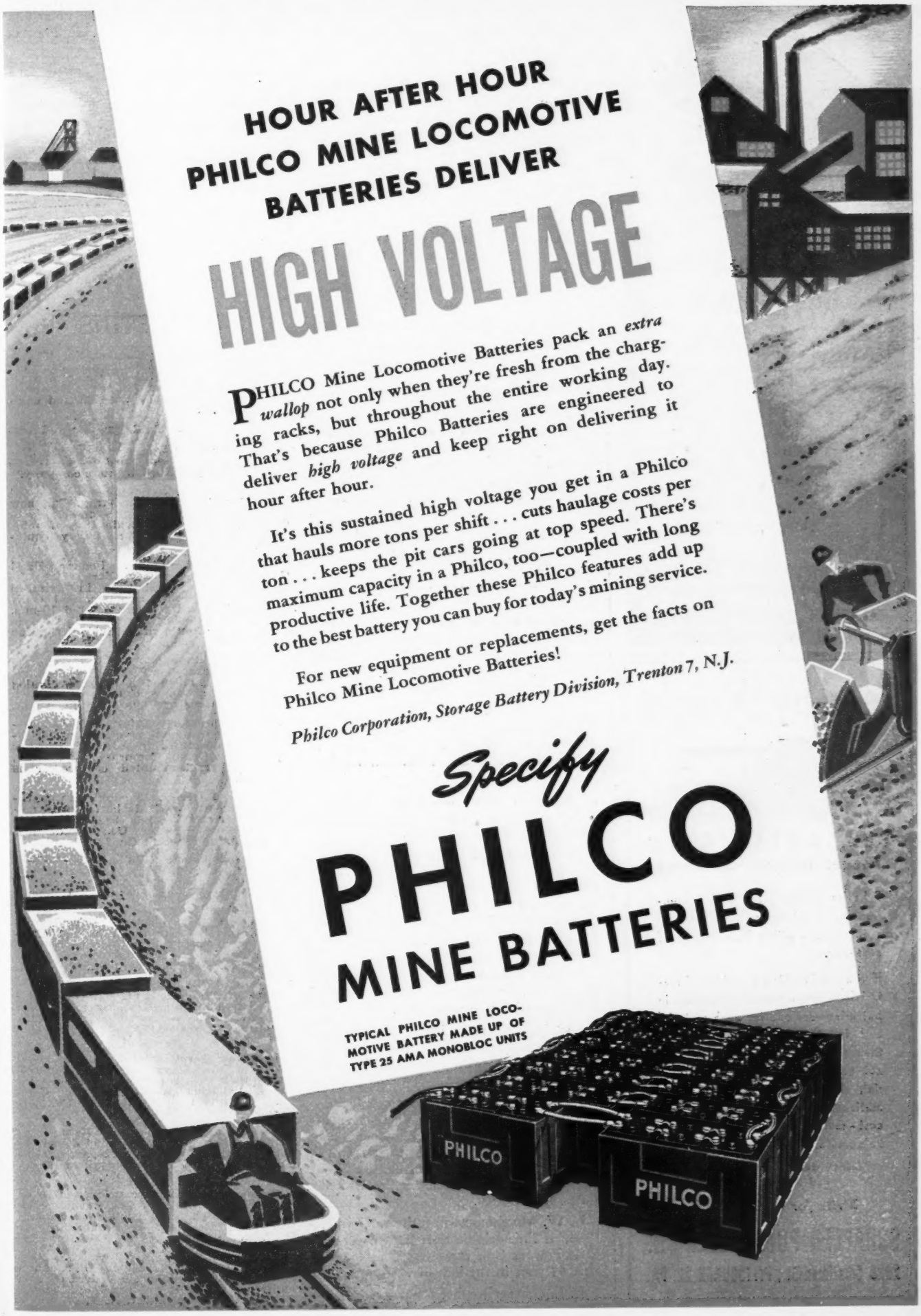
A newly designed heavy-duty truck crane, for which the manufacturer claims increased efficiency and mobility, has been announced by Harnischfeger Corp., Milwaukee, Wis. Main feature is said to be a carrier designed to aid the work of the crane rather than merely to transport the crane. Center of gravity is low and greater stability has been provided in terms of hoisting capacity and boom reach. With outriggers, the working range is proportionately increased. Machinery is a standard P&H Model 225-A crane upper, with hydraulic control and planetary boom hoist. The manufacturer will furnish details.

INDUSTRIAL NOTES

Army-Navy "E" awards, or renewals of existing awards, have been given to the following companies: **Yuba Manufacturing Co.,** Benicia, Calif.; **Handy & Harman,** Bridgeport, Conn.; **Bristol Co.,** Waterbury, Conn.; **Electric Storage Battery Co.,** Philadelphia, Pa.; **LaPlant-Choate Mfg. Co., Inc.,** Cedar Rapids, Iowa; **Philco Corp.,** Storage Battery Division, Trenton, N. J.; **Mack Trucks, Inc.,** New York, N. Y.; **Link-Belt Co.,** San Francisco, Calif.

Denver Equipment Co. now has its New York office in Suite 4114, Empire State Bldg., New York 1, N. Y.

R. G. LeTourneau, Inc., Peoria, Ill., announces the formation of its own exclusive sales distribution organization under the direction of **E. R. Galvin,** general sales manager. **Paul Fulford** is export sales manager; **Howard L. Stilley, H. R. Conn,** and **Harry L. Vines** are central, eastern, and western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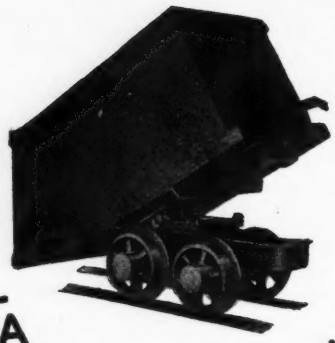

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Schaffer Poidometers will proportion or feed your bulk material automatically with a high degree of accuracy.

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sales managers, respectively. These men will all be located in Peoria, except Mr. Vines, whose headquarters will be Stockton, Calif.

Great Western Division of Dow Chemical Co. has opened a flotation testing laboratory at 220 Battery St., San Francisco, Calif., under the direction of **Dr. W. Hirschkind,** Great Western's director of research. The laboratory's staff of eight men will be headed by **J. D. Vincent,** with **C. H. Keller** as consultant, and **C. F. Williams** and **C. F. Zeuch** as metallurgists.

Richard F. Norris has been appointed Iron Range representative of Marion Steam Shovel, Marion, Ohio. Mr. Norris is located at 710 Michigan Ave., Hibbing, Minn.

A. J. Philpott Co., Denver, Colo., has been appointed distributor in the central western region for the construction and mining equipment division of Worthington Pump & Machinery Co., and for **Atlas Car & Manufacturing Co.**

Ralph O. Smith has been appointed general sales manager of Vulcan Iron Works, Wilkes-Barre, Pa. Mr. Smith, who was formerly in charge of mining machinery sales, has been with the company since 1918.

Grant Fitch has been transferred from the Ishpeming, Mich., office of **Westinghouse Electric & Mfg. Co.** to the office at Milwaukee, Wis. The former office will be closed.

Election of three new vice-presidents for **Allis-Chalmers Mfg. Co.,** Milwaukee, Wis., was announced recently by **Walter Geist,** president. They are: **William C. Johnson, James M. White,** and **William A. Roberts.**

Geophysical Instrument Co. announces completion and occupancy of its new research laboratories and instrument plant at Key Boulevard and Nash St., Arlington, Va.

Frank M. Blum has been appointed manager of the sales division of **Harnischfeger Corp.,** Milwaukee, Wis.

L. A. Selleg, formerly a salesman in the Milwaukee, Wis., office of **Westinghouse Electric & Mfg. Co.,** has been appointed manager of the company's petroleum, chemical, and mining section of the Northwestern District with headquarters in Chicago.

Wallace Johnson was recently appointed general sales manager of **Joshua Hendy Iron Works,** Sunnyvale, Calif.

Link-Belt Co., Pacific Division, has opened a sales office and warehouse in Spokane, Wash., with **Homer A. Garland** in charge.

J. A. Drain, Jr., has been elected vice-president in charge of production engineering research and development of **Sullivan Machinery Co.,** Michigan City, Ind. **O. J. Neslage** has been elected vice-president in charge of sales in the United States and Mexico.

E. W. Morehouse will retire on July 1, 1944, as Philadelphia district manager of **Atlas Powder Co.,** explosives department, after 44 years in the industry.

E. L. Gartner has been appointed manager of the Metal and Ore Division, **Grasselli Chemical** Dept., E. I. du Pont de Nemours & Co.

Allis-Chalmers Mfg. Co., Tractor Division, has opened a new district sales office in Seattle, Wash., in the White-Henry-Stuart building with **Stanley B. Tatom** as manager.

Jack B. Bond has joined the sales and engineering staff of the crusher division of **Nordberg Mfg. Co.,** Milwaukee, Wis.

Thomas Backus, formerly chief engineer of Fuller Mfg. Co., has been appointed chief engineer for **R. G. LeTourneau, Inc.,** Peoria, Ill.

BULLETINS

Air Compressors. Catalog No. 4215 of Schramm, Inc., West Chester, Pa., describes in complete detail the company's No. 60 type air compressor in various mountings for the construction and engineering fields.

Log Washers. Sand, gravel, and ore-washing and classifying equipment manufactured by Eagle Iron Works, Des Moines, Iowa, is described in a 24-page bulletin just published by that company.

Car and Track Equipment. Pressed Steel Car Co., Inc., Pittsburgh, Pa., now has available five bulletins describing in detail the company's wide line of mine and quarry cars and necessary equipment.

Tunnel Driving Film. Ingersoll-Rand Co., 11 Broadway, New York, 4, N. Y., has available for showing in technical schools, engineering societies, and other interested organizations a colored 16-mm. sound film showing the methods used in driving the Continental Divide irrigation tunnel in Colorado.

Victaulic Piping. Victaulic Co. of America, Rockefeller Plaza, New York, 20, N. Y., has published a 35-page catalog and manual showing design data for various applications of Victaulic-coupled pipe.

Air Compressors. Air-cooled compressors for use in mining or quarrying operations are described in a folder recently released by Davey Compressor Co., Kent, Ohio. A track-mounted compressor is featured.

Storage Batteries. A booklet on charging equipment for Exide batteries in motive power service has been issued by Electric Storage Battery Co., Philadelphia, 32, Pa. Ask for Bulletin 207.

Gas Exhausters. Bulletin 32-33-B-12 covering rotary positive gas exhausters and boosters has just been released by Roots-Connersville Blower Corp., Connersville, Ind.

How to Correct Workers. How to correct workers' faults tactfully and effectively is discussed in a new booklet by Glenn Gardiner published by Elliott Service Co., 219 East 44th St., N. Y., 17, N. Y.

Care of Piping. Hints for proper installation and care of piping and valves are offered in a new bulletin, "Piping Pointers," published by Crane Co., Chicago, 5, Ill.

Contract Terminations. Lyon Metal Products Inc., Aurora, Ill., has prepared, out of their own experience, a booklet for free distribution called, "How One Company Organized to Handle War Contract Terminations."

Diesel Engines. The new Hendy stationery and marine series "50" diesel engine is fully described in a 12-page catalog just released by Josha Hendy Iron Works, of Sunnyvale, Calif.

Rubber Clothing. A catalog section on its recently introduced line of industrial clothing coated with rubber or rubber-like materials has been published by B. F. Goodrich Co., Akron, Ohio.

Non-Inflammable Transformers. Electric transformers filled with Pyranol, a non-inflammable liquid, are described in bulletin GEA-4193, published by General Electric Co., Schenectady, N. Y.